

**A Digitally Delivered and Fully Automated Internet- and Mobile-  
Based Smoking Cessation Programme:  
A Randomized Controlled Trial**

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# Table of Contents

Acknowledgements 5

Abstract 6

## 1 Introduction 7

1.1 *Smoking Attributable Mortality and Health Consequences* 7

1.2 *Smoking Prevalence and Behavioural Intentions* 8

1.3 *Smoking Cessation* 9

1.4 *Information and Communication Technology Interventions* 10

## 2 The Theoretical Background of Happy Ending 11

2.1 *The Preparation Phase* 11

2.2 *The Action Phase* 13

2.3 *The Maintenance Phase* 16

## 3 Objectives 17

## 4 Methods 18

4.1 *Interventions* 18

4.2 *Sample Size and Recruitment* 19

4.3 *Randomization* 20

4.4 *Blinding* 20

4.5 *Follow-Up Procedures* 21

4.6 *Measures* 21

4.7 *Statistical Methods* 23

## 5 Results 24

5.1 *Baseline Data and Response Rates* 24

5.2 *Abstinence* 26

5.3 *Interaction Effects* 27

5.4 *Between-Groups Differences in Self-Efficacy and Coping Planning* 27

5.5 *Mediation* 28

**5.6 Programme Evaluation 29**

**5.7 Adverse Effects 29**

**6 Discussion 30**

**6.1 Synopsis 30**

**6.2 Interpretation of the Results 30**

**6.3 Limitations 34**

**6.4 Generalizability 35**

**6.5 Conclusions 36**

**7 Reference List 37**

**Appendix A 50**

**Figure A1. The Flow Chart of Participants 50**

**Appendix B 51**

**B.01 Table B4.1. The Relationship between Experimental Condition, 3-Days Pre-Cessation Self-Efficacy, and Abstinence at 1 Month 51**

**B.02 Table B4.2. Intercorrelations for the Relationship between Experimental Condition, 3-Days Pre-Cessation Coping Planning, and Abstinence at 1 Month 52**

**B.03 Table B4.3 Mean Values and Frequencies for Measures as a Function of Abstinence at 1 Month 52**

**Appendix C 53**

**C.01 Table C5.1. The Relationship between Experimental Condition, 3-Days Pre-Cessation Coping Planning, and Abstinence at 1 Month 53**

**C.02 Table C5.2. Intercorrelations for the Relationship between Experimental Condition, 3-Days Pre-Cessation Coping Planning, and Abstinence at 1 Month 54**

**C.03 Table C5.3 Mean Values and Frequencies for Measures as a Function of Abstinence at 1 Month 54**

## **Appendix D**

Figure D2. Comparison of Treatment Effects Across Different Studies and Types of Interventions **55**

## **Appendix E**

Scales and Measures **56**

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A printed copy of the report is available for review at The University of Oslo Library. An electronic version of the abstract and report can be requested at Digitale Utgivelser ved UiO (DUO; <http://www.duo.uio.no>).

## Abstract

**Objective:** The primary objective of this study was to test the long-term (6 months) efficacy of an Internet- and mobile-based smoking cessation programme.

**Design:** A two-armed randomized control trial. Participants surveyed at baseline and 3-days pre-cessation, and 1, 3, and 6 months post-cessation.

**Setting:** Norway. The study and the experimental condition occurred via the Internet and mobile-phone. The control condition received self-help booklets through the postal mail service.

**Participants:** A total of 427 eligible participants were assessed of which 290 were included in the study. Participants were treatment seeking smokers recruited online through local and regional covering newspapers. All participants were above the age of 18, had daily access to the Internet and a mobile phone, and currently smoking five cigarettes or more on a daily basis.

**Methods:** The Internet- and mobile phone-based intervention consists of image- and text-based websites containing different educational components. The purpose of the mobile phone is to support the activities and processes initiated through the web with some additional features. The control condition received a self-help booklet. Online self-report measures were used to collect data with no biochemical verification while email reminders and telephone interviews were conducted as follow-up. The primary outcome measure was 7-days abstinence at 6 months. Secondary outcomes included 7-days abstinence at 1 and 3 months.

**Results:** Using an intent-to-treat analysis, more participants in the experimental condition had quit smoking compared to the control group at 6 months: 42 (29%) vs. 20 (14%), odds ratio = 2.59 (95% confidence intervals: 1.43 - 4.69.),  $p = .002$ . The treatment effect was also present at 1 (odds ratio = 3.46, 95% confidence intervals: 2.01 - 5.95) and 3 months (odds ratio = 2.93, 95% confidence intervals: 1.67 - 5.14).

**Conclusions:** These results suggest that a smoking cessation programme can be successfully delivered via the Internet and mobile-phone.

**Keywords:** Smoking cessation, randomized control trial, Internet, mobile phone, self-efficacy, coping planning.

# 1 Introduction

## 1.1 *Smoking Attributable Mortality and Health Consequences*

Smoking is identified as the second most leading risk factor in the burden of premature mortality and morbidity (World Health Organization [WHO], 2002, 2007). Simultaneously, it is the most preventable cause of mortality because of the lag between smoking onset and disease occurrence (U.S. Department of Health and Human Services, 2004; WHO, 2002). Hazards associated with smoking can be almost completely avoided if cessation occurs at the age of 30 and halved at the age of 50 (Doll, Peto, Boreham & Sutherland, 2004). Therefore, smoking cessation alone is likely to yield a reduction in mortality.

Annually, about 30% (440 000) of the U.S. death toll is attributable to smoking (Centers for Disease Control and Prevention [CDCP], 2002, 2005). Each American person who die of smoking lose on average 13 years of potential life expectancy which amounts to a total of 5.5 million years of life lost in the U.S. (CDCP, 2005). In Europe smoking accounts for 12% of total years of life lost due to premature mortality and years lived in disability (WHO, 2002, 2007). This equates to about 18.6 million years of life lost. In comparison, Vollset, Selmer, Tverdal and Gjessing (2006) estimated that smoking accounted for 16% (6,700) of all deaths in Norway in 2003. On average, each person who died of smoking lost 11 years of potential life expectancy which amounts to 72,000 years of life lost. Moreover, more than half of the global smoking attributable mortality occurs between the ages 30 to 69 years (Ezzati & Lopez, 2003; Peto, Lopez, Boreham, Thun & Heath, 1992). It is estimated that these middle-aged women and men lose on average 23 years of potential life expectancy (Peto et al., 1992). In comparison, 40% of Norwegian deaths among middle-aged (40 to 70 years of age) women and men is attributable to smoking (Vollset, Selmer et al., 2006; Vollset, Tverdal & Gjessing, 2006).

Smokers as compared to never smokers are at a significantly elevated risk for death due to coronary heart diseases, chronic obstructive pulmonary diseases, all types of strokes, other arterial diseases, lung cancer, and other types of cancers (Danaei et al. 2005; Ezzati & Lopez, 2003; Jacobs et al. 1999; for overview, see; Fagerström, 2002). In Norway, for example; 18% (1,900) of cancers, 18% (3,200) of coronary heart diseases, and 29% (1,300) of respiratory diseases in 2001 were attributable to smoking (Sanner, 2005, for examples, see; Humerfelt & Gulsvik, 1995; Tverdal, 1995; Vollset, Tverdal et al., 2006). Additionally, exposures of environmental tobacco smoke causes premature death and diseases in children and adults who

do not smoke, e.g. slow lung growth in children, sudden infant death syndrome, acute respiratory infections, and severe asthma (Dybing & Sanner, 1999; U.S. Department of Health and Human Services, 2006). In Norway it is estimated that 300 to 500 non-smokers die due to heart disease (Dybing & Sanner, 1995) and that 50 non-smokers die due to lung cancer caused by passive smoking (Sanner & Dybing, 1996; Norwegian Directorate for Health and Social Affairs, 2003). As if that was not enough, smoking must also be considered an important risk factor for the prognosis and development of diseases which are not causally related, e.g. dermatological changes, diabetes, gastric ulcer, including more (Haustein, 2003).

## **1.2 *Smoking Prevalence and Behavioural Intentions***

About 24% of the Norwegian population aged 16 to 74 are daily smokers and 10% report being occasional smokers (Statistics Norway, 2007). In perspective, the mean population-weighted smoking prevalence rate in Europe is 29% (WHO, 2007) which includes 18% smokers among females and 40% smokers among males. In Norway, there are no gender differences in smoking prevalence, but there are nearly three times as high a proportion of smokers with compulsory education as compared to the proportion of smokers with a college or university education. A similar gap exists in smoking prevalence between smokers with higher education and smokers with lower education in Europe. The gap is especially accentuated in the western part of the European region (e.g. Ireland, France, and Iceland). Norwegian smokers who have only completed compulsory education are overrepresented among daily smokers which have not made a quit attempt the last year, that have no intentions of quitting the next 6 months, and which have a future identity as a smoker (Lund, Lund & Rise, 2005). Alongside heavy smokers, smokers who started smoking early, and smokers who use hand-rolled tobacco, they are the least interested in quitting (Lund & Lund, 2005; Lund, Lund & Rise, 2005). They have fewer future perspectives on quit activity, fewer restrictions for indoors smoking at home, and are less informed about existing professional assistance (Lund, Lund & Rise, 2005).

Among all Norwegian smokers, approximately 80% report having attempted to quit smoking sometime, 44% report intentions to quit within the next 6 months, whereas 11% report intentions to quit within the next 30 days (Norwegian Directorate for Health and Social Affairs [NDHSA], 2004). Thus, it seems fair to say many Norwegian smokers are motivated to quit. However, behaviour change does not necessarily follow good intentions (Sheeran, Webb & Gollwitzer, 2005). Figures are ranging from 20% (NDHSA, 2004) to 30% (Kraft, Svendsen & Hauknes, 1998) for those who actually made a quit attempt the last 12 months.



This shows that the traditional behaviour-intention gap is at the very utmost prevailing in relation to smoking cessation (for examples, see; Moan & Rise, 2005; Norman, Connor & Bell, 1999). The behaviour-intention gap most likely reflects that smokers have difficulties anticipating their actual control over quitting smoking and highlights the need for assistance.

### **1.3 *Smoking Cessation***

Abstinent rates above 30% are rare even among cost-intensive interventions that usually are the most effective as designed by professionals (Fiore et al., 2000). However, the majorities of those who attempt quitting do so without any professional assistance at all. Only one in five who attempted to quit smoking the past 12 months reported having used assistance (Cokkinides, Ward, Jemal & Thun, 2005; Zhu, Melcer, Sun, Rosbrook & Pierce, 2000). Among Norwegian ex-smokers, the reported use of assistance in relation to their last successful quit attempt was rather low. Only 10%, 7%, and 5% reported using nicotine gum, nicotine patch, or seeking advice from health professionals respectively (NDHSA, 2004). The problem with discarding professional assistance is that most unaided quitters relapse within 6-12 months (Fiore et al. 2000; Hughes, Keely & Naud, 2004; Ward, Klesges, Zbikowski, Bliss & Garvey, 1997). Normally about 50% relapse within the first two weeks, 65% within the first month, and 92% within four months (NDHSA, 2004). This equals a successful long-term cessation rate less than 1 to 10. Even long-term abstinence rates as low as three to five percent has been reported (Hughes et al. 2004).

Clearly, professional assistance is not being utilized to its full potential, but nevertheless, smokers report a certain preference for self-help materials and counselling (Cunningham, Ferrence, Cohen & Adlaf, 2003; Spoth, 1991; Ussher, West & Hibbs, 2004; Zhu et al., 2000). Self-help includes a wide range of materials and supplements like books, booklets, social support, telephone counselling, audio-, and videotapes. They are commonly inexpensive to deliver and can be disseminated at a large scale in the population. Self-help materials are possibly better than no intervention at all, but they are not especially effective in most cases (Lancaster & Stead, 2005a). Hence, they are only to be considered cost-effective given that they have a treatment effect.

The most widely used therapeutic treatments often combine cognitive therapy and behavioural skills training which can be delivered individually or in a group. In both cases, individual behavioural counselling (Lancaster & Stead, 2005b) and group behavioural therapy (Stead & Lancaster, 2005) can effectively assist smokers to quit. However, the drawbacks of counselling are (a) the time it consumes, (b) the physical boundaries of space, and (c) the

expenses related to treatment. Additionally, counselling lacks the immediacy of help when encountering critical situations or experiencing withdrawal symptoms as is possible to offer through information and communication technology (ICT).

#### **1.4 *Information and Communication Technology Interventions***

In contrast to behavioural counselling, technology has the potential to reach many smokers at a low cost and to mimic the transactional qualities of human communication (Cassell, Jackson & Cheuvront, 1998), e.g. imitate behavioural therapy. Psychological theory, models, and therapy combined with the Internet and mobile-phone technology can be an effective method for disseminating knowledge and materials at a population level. Several studies suggest that computer-based smoking cessation programmes (for examples, see; Etter, 2005; Lenert et al. 2003; Strecher, Shiffman & West, 2005; Swartz, Noell, Schroeder & Ary, 2006) and text messaging (Rodgers et al. 2005) are effective, but few studies have examined the long-term outcomes [defined as 6 months or longer (Etter, 2006; for example, see; Munoz et al. 2006)].

Strecher (1999) reviewed ten first generation computer-based smoking cessation interventions which refer to (a) collecting individual characteristics relevant to smoking cessation, (b) a computer algorithm that uses the collected data and generates a tailored message to the specific needs of the user, and (c) feedback delivered in paper format. Six out of nine studies offered evidence supporting the effect of computer-based tailored materials and one study found partially positive effects. More recently Walters, Wright & Shegog (2006) reviewed digitally delivered smoking cessation interventions and identified 19 studies of which nine showed improved outcomes as compared to control conditions. Both Strecher (1999) and Walters et al. (2006) found few consistent patterns or intervention characteristics which led to positive outcomes. But it was suggested that tailored computer-based materials (Strecher, 1999) and theoretically-based interventions (Walters et al.) are likely to be more effective.

The present study was set to evaluate one such ICT-based intervention with a theoretical foundation. A problem at the current moment with ICT-based smoking cessation research is that studies do not usually report on what theoretical basis the intervention was designed, how psychological constructs were attempted to manipulate, and so forth. Under such conditions, it becomes very difficult for other researchers and health professionals to learn from research. Therefore, the following describes the theory and research that was used to design *Happy Ending*, i.e. how Happy Ending combines Internet- and mobile-based technology to deliver self-help management materials, cognitive-behavioural counselling, and relapse prevention.

## **2 The Theoretical Background of Happy Ending**

Happy Ending (HE) is a digitally delivered and fully automated Internet- and mobile phone-based smoking cessation programme based on psychological research. It is intended for individual behaviour change across genders, all ages, educational levels, etc. Rothman (2000; Rothman, Baldwin & Hertel, 2004) argues for the distinction of the processes or decision criteria underlying behaviour initiation, behaviour maintenance and habit formation. The implications are such that interventions aiming at the different distinct processes have to apply different programme elements. Interventions aiming at behaviour initiation should maybe focus on motivation while interventions aiming at maintenance and habit formation should focus on aiding quitters in performing and controlling behaviour. Because Happy Ending concerns behavioural maintenance and habit formation, Happy Ending is specifically designed for smokers already motivated to quit to assist performing, maintaining, and forming a new and healthy habit.

### **2.1 *The Preparation Phase***

Happy Ending (HE) begins with a 14 days preparation phase. The client receives an email every morning with a link to an external website. There is a unique website every day which the client has access to only that specific day. The reason for this strict regimen is because HE is constructed on the basis of a reasoned chronology. The chronology is modelled according to the psychological processes smokers experience at different points in the process of smoking cessation (Brandon, Tiffany, Obremski & Baker, 1990; Gilbert & Warburton, 2003; Lichtenstein & Glasgow, 1992; Piasecki, Fiore & Baker, 1998; Piasecki, Fiore, McCarthy & Baker, 2002; Piasecki, Jorenby, Smith, Fiore & Baker, 2003a, 2003b, 2003c; Shiffman, 2005; Shiffman, Paty, Gnys, Kassel & Hickcox, 1996; Shiffman & Waters, 2004; Kenford et al., 2002; Ockene et al., 2000; Piasecki et al., 2000; Shiffman, Hickcox et al., 1996; Shiffman et al., 1997).

For such reasons, the client spends the first few days in the programme building a therapeutic alliance and confidence in the treatment provider. These are just two of the ground rules of cognitive-behavioural therapy (for overview, see; Berge & Repål, 2005) which HE aims at establishing early. In addition, it is fundamental for positive outcomes in treatment that the client gets engaged and involved in his or her own process of smoking cessation. This

means the client must understand the procedure during treatment, the most important concepts, and appreciate how our thoughts can influence our emotions.

One of the first concepts the client learn about is self-monitoring. Self-monitoring is a self-regulatory tool to help the client not only become consciously aware of their own behaviour, but help him or her get actively engaged and involved (Baumeister & Heatherton, 1996; Baumeister, Heatherton & Tice; 1994). Violation to the principle of self-monitoring can result in disengagement and break the dose-response relationship between treatment intensity and probability of positive outcomes (Lancaster & Stead, 2004; Silagy, Lancaster, Stead, Mant & Fowler, 2004; West, McNeill & Raw, 2000; Ockene et al., 1994).

A second concept is self-efficacy which is an important determinant for the outcome of self-change processes (Bandura, 1977). Self-perception of efficacy influence people's cognitions, behaviour, and emotional arousal and refer to people's beliefs in their own capability to exercise control over the events that affect their lives (Bandura, 1982, 1989). Pre- and post-cessation self-efficacy has both been shown to play an important role in relation to smoking cessation (Schwarzer & Fuchs, 1995; for examples, see; Condiotte & Lichtenstein, 1981; Stuart, Borland & McMurray, 1994). As a general rule, the belief and confidence in the person's own ability to change should be high, but not overly optimistic or unrealistic. Unrealistically high self-efficacy can cause transgressions to affect the person negatively (Schwarzer & Fuchs, 1995).

Besides learning about important concepts, HE contains web-based activities (e.g. problem-solving tasks, cognitive and emotional tasks, writing an interactive personal diary) and information where the client learns about his or her psychological profile and responses as a person and as a smoker. The client learns about his or her past smoking behaviour, nicotine dependence, past quit failures, motivational basis for quitting, problems often experienced when quitting, stress and weight regulation, the use of nicotine replacement therapy, and more. There is especially one important psycho-educational component which addresses the issue of lapses, i.e. smoking a few cigarettes during a quit attempt, and relapse, i.e. returning to past smoking behaviour. The client learns that it is completely normal to experience one or several lapses (Hughes et al., 2004; Piasecki et al., 2002). It is not critical whether a client experiences a lapse or two, but how the client reacts cognitively, affectively, and behaviourally. The purpose is to prevent the devastating consequences of zero-tolerance beliefs (Baumeister et al. 1994) and to prevent minor transgressions to cause a full-blown relapse (Larimer, Palmer & Marlatt, 1999; Marlatt & Gordon, 1985). The client prepares for these reactions in case of a lapse, becomes enabled to recognize the reactions when they

occur, and acquires specific skills and support systems to master lapses. Hence, the probability for successful self-regulation should increase significantly (Baumeister et al.).

In addition to the websites, HE communicates via the mobile phone and interactive voice response (IVR; phone technology that typically allows a person to select options from a voice menu and interact with the phone system). The purpose is twofold. First, the client must get acquainted with and used to communicating with HE via the mobile phone. The mobile phone will play a crucial role later during the action and maintenance phase in the programme. Second, the mobile phone is used to support the activities and processes initiated through the websites. The two-way communication will also ensure active participation on behalf of the client, as well as it will give the perception of individualization in the follow-up of the programme.

## **2.2 *The Action Phase***

Upon completing the preparation phase, the client enters a 30 days action phase. Up to this point the client has been smoking his or her usual amount of daily cigarettes. What happens now is that the client stops smoking completely. During this phase further activities and processes are initiated through the websites to ensure active participation and involvement. Hence, there are numerous contact points between the client and HE each day at an even increased intensity and frequency than previously (minimum four contact points via the mobile phone).

One of the first expected difficulties to arise is a shift in the motivational basis for quitting (Gilbert & Warburton, 2003; Rothman, 2000; Rothman et al. 2004). In particular, the loss of positive short-term consequences of smoking (e.g. becoming relaxed, less irritable) tend to become pronounced while the importance of positive long-term outcomes (e.g. reduced risk for coronary heart disease, reduced risk for cancer) tend to become deflated (Gilbert & Warburton, 2003). To prevent changes in motivational basis, HE provides a type of biofeedback about the positive consequences of quitting (e.g. normalization of body temperature, reduced risk for catching a cold, drop in blood pressure equivalent to that of a non-smoker). The client receives these messages via the mobile phone using IVR.

Other expected difficulties to occur are changes in self-efficacy, changes in affect, and the encounter of high-risk situations. First, an aim in the programme is to strengthen the post-cessational self-efficacy as it has been identified as a key predictor for the outcome of a smoking cessation attempt (Condiotte & Lichtenstein, 1981; Gulliver, Hughes, Solomon & Dey, 1995; Schwarzer & Fuchs, 1995). More specifically, variations in self-efficacy have

been detected to occur prior to lapses and relapse (Dijkstra & Brosschot, 2003; Dijkstra & Wolde, 2005; Gwaltney, Shiffman, Balabanis & Paty, 2005; Shiffman, 2005; Shiffman et al., 1997; Shiffman et al., 2000). To strengthen and stabilize post-cessational self-efficacy HE (a) reminds the client about the wide range of skills acquired and tools available to them, (b) prepares the client psychologically for tempting situations, and (c) encourages learning from mastery experience.

Second, negative affect (e.g. frustration, anger, depression) has also been identified as a predictor of lapses and relapse (Shiffman, Paty et al., 1996; Shiffman & Waters, 2004). It has been detected to be increasing especially in the hours before lapses (Shiffman & Waters, 2004). An affective model of drug motivation holds that affective states serve as stimuli for self-administration of drugs (Niaura et al., 1988) and it has been suggested that nicotine withdrawal symptomatology depends to a large extent on changes in negative affect (Piasecki, Kenford, Smith, Fiore & Baker, 1997). HE attempts to prevent negative affect by having available a Helpline which offers mood regulation and by sending encouraging messages telling the clients to e.g. reward their own accomplishments.

Third, a very central element in the everyday activities in this phase is to have the client make explicit implementation intentions and coping planning regarding how to stay abstinent. This is done by giving the client small problem-solving tasks, cognitive and emotional tasks, and tasks that support reflection. In short, implementation intentions are specified goal-directed responses to perform when encountering critical situations (Gollwitzer, 1999; Gollwitzer, Fujita & Oettingen, 2004) while coping planning refers to preparing coping strategies which will help prioritize the intended over the habitual in critical situations (Sniehotta, Scholz & Schwarzer, 2006). The former refers to behavioural coping strategies while the latter refers to cognitive coping strategies, and both are suggested as important mechanisms against relapse (for example, see; Gollwitzer et al., 2004; Sniehotta, Schwarzer, Scholz & Schuz, 2005).

In the action phase, there is a log-on procedure every morning which means the client has to call HE. During this call, the client receives a confirmation that he or she is logged on and listens to a unique health message every day (e.g. what has happened to your health, appearance, breath). If the client does not log on, several text messages are automatically sent to the client's mobile phone reminding him or her to log on. This is to assure active participation and self-monitoring so as to avoid that the client becomes psychologically remote in relation to the self-change process (Baumeister et al. 1994).

In the evening (between 8 p. m. and 11 p. m.) there is a log off procedure where HE calls the client. If the client does not answer, subsequent calls are attempted. If the client still does not answer, the client receives a text message reminding him or her to call HE and log off. The client reports if he or she has managed to stay abstinent during the day. If the client has been successfully abstinent, everything is going according to plans and there is no further need for change. On the other hand, if the client reports having smoked, regardless of how many cigarettes, a relapse prevention system is automatically activated. One of five different regimens may be activated depending on the number of lapses reported earlier in the programme. The purpose of each regime is to make the client attribute the lapse(s) as situational, thereby preventing lowered self-efficacy, negative affect, and eventually a relapse. The other purpose is to make the client accept the fact that a relapse is part of a deliberate decision and not something he or she is powerless to control or prevent.

The relapse prevention system in HE is based upon the relapse proneness (RP) model as outlined by Piasecki et al. (2002). They prescribe a dynamic model of the natural history of the relapse process. According to the RP model, the first two weeks are characterized by physiological symptoms. These symptoms are primarily counter-reactions caused by the declining drug levels in the body. After the first couple of weeks at the demise of the physiological symptoms, the psychological symptoms become more pronounced. This phase is characterized by slow oscillations with occasional sudden and random bursts in relapse proneness. It is precisely during these sudden bursts in proneness a smoker is at the most vulnerable and most likely to experience a lapse or relapse. The last phase of the RP model is characterized by fatigue which is concurrent with self-regulatory strength in the self-regulation model (Baumeister et al. 1994). Efforts requiring self-regulation taps the smoker of strength, and as a result, fatigue becomes an impediment for subsequent efforts of controlling behaviour (for overview, see; Muraven & Baumeister, 2000).

In addition to considering the fact that a large proportion of quitters are likely to relapse, it is important to remember that a relapse typically follows a pattern of intermittent episodes of smoking (Ockene et al. 2000). Hence, an intervention should aim at restricting the amount of cigarettes smoked during lapses since this variable seems to predict the probability of later abstinence. After an initial lapse, a second lapse is very likely to occur often within one to four days (Brandon et al., 1990; Shiffman, Hickcox et al., 1996). Therefore, more effective smoking cessation interventions should be able to offer instant treatment to prevent the escalation of the process that promotes a following lapse or relapse, hence the log off procedure in HE.

The Helpline is another support system in HE which intends to offer instant help and which adds to the variety of different available tools. It is available to the client day and night throughout the entire programme from the onset of the action phase. The client is supposed to pre-program the number to the Helpline on their mobile phone to provide quick and easy access. Then, by specifying implementation intentions like ‘If I feel tempted to smoke a cigarette, I will call the Helpline’, the client might gain the necessary cognitive control over attention, thereby derailing the focus from the cravings.

Whenever the client calls the Helpline, he or she is asked to specify what kind of help they need. There are three kinds of help; (a) support and mood regulation, (b) stress regulation, and (c) motivation to continue. The messages are constructed by professional psychologists and recorded by professional actors, containing a pool of 45 unique messages. Note that both the content and context of the therapeutic messages vary (e.g. testimonials, instructions given by a psychologist, doctor-patient conversations) It is worth noting that the message addresses the kind of help the client has specified and that the message is only indirectly related to smoking. What message the client receives is registered so as to avoid receiving the same message twice. The reasoned theory behind the Helpline is that it initially acts to create an attentional shift when making the call. Or else, increased self-awareness during acute pain or discomfort may actually increase the subjective perception of pain or discomfort (Baumeister, et al. 1994; Vohs & Schmeichel, 2003). Second, because cravings are episodic and relatively short lived (Piasecki, 2006), a call to the Helpline may distract the quitter long enough for the cravings to have subdued. Third, the content of the message itself is of course intended to assist with the issue the client wishes to address (e.g. mood regulation).

### **2.3 *The Maintenance Phase***

Finally, all clients are offered a maintenance phase which can last up to 11 months (optional duration). During the maintenance phase, the client no longer receives links to any websites. The log on procedure in the morning will shut down and the frequency of the log off procedure will be reduced in the upcoming weeks. The log off procedure continues immediately after the action phase daily for another month, twice a week for another two weeks, and then once a week for the remaining maintenance phase. The client will, however, remain unlimited access to the Helpline throughout the entire maintenance phase and continue to receive encouraging text and IVR messages. However, no new activities or concepts are initiated or introduced.



### 3 Objectives

The current study's primary objective was to test the hypothesis that HE produces an increased long-term, i.e. 6 months, cessation rate in treatment seeking smokers, as compared to a control group receiving a self-help booklet (SHB). A plausible explanation for the hypothesized difference is that HE indeed mimics the qualities of cognitive-behavioural therapy, develops self-regulatory capacity, and offers instant relapse prevention. Moreover, the study investigated possible interaction effects between the experimental condition and several background variables, i.e. gender, age, education, and nicotine dependence, upon cessation outcome. Because HE is designed to assist anyone whom is a smoker and motivated to quit it was expected that few interaction effects would occur. Nevertheless, this had to be tested in order to know.

The study also had several secondary objectives. First, the study tested the hypothesis that HE increases participant's self-efficacy as compared to the SHB group. The reason to expect this is because HE includes preparing participants for expected difficulties, reminding the participants about their skills and their support system among other things. The study also tested the hypothesis that HE increases the extent to which smokers perform coping planning as compared to the SHB group. On the basis of including problem-solving tasks, reflecting, and specifying coping responses related to tempting or critical situations, it is expected that HE increases coping planning as well.

Second, the study examined whether self-efficacy or coping planning mediates the effect of abstinence at 1 month separately. The HE program is designed to enhance both self-efficacy and coping planning mainly during the 14-days preparation phase and 30-days action phase. This is one of the reasons why the point-measurement is narrowed down to 1 month post-cessation. The second reason is that any long-term mediation effects are expected to become attenuated as time passes and other variables come into play.

Third, the study aimed at testing the difference in overall perceived usefulness and recommendation between the HE group and the SHB group at 3 months, shortly after the intensity of the HE programme is reduced to a minimum. Even though HE is likely to produce higher abstinence rates as compared to the SHB group, differences in overall perceived usefulness and recommendation cannot be expected in a natural setting.

## 4 Methods

### 4.1 Interventions

The present study was conducted from February to September 2006. Enrolled participants were randomly assigned to one of two treatment conditions: the Internet- and mobile-based Happy Ending programme or the self-help booklet. Participants randomized to the experimental condition, that is Happy Ending, were registered with their email address and mobile phone number so the intervention would automatically start the preparation phase on the 20th of February. This means that the actual quit-date and initiation of the action phase would begin on the 6th of March. Participants randomized to the control condition received the booklet prior to the 20th of February, so as to be able to follow a 10-days program of preparation before quitting. All participants quit on the designated date (March the 6th, 2006).

**Happy Ending.** Happy Ending was originally established by Professor Pål Kraft at the University of Oslo and Harald Schjelderup-Lund. In the beginning, Happy Ending was supported by a professional advisory board including some of the leading researchers in Norway on smoking cessation. The programme was initially developed and designed for the Norwegian market in cooperation with the Norwegian Directorate for Health and Social Affairs and funded by The Research Council of Norway. Happy Ending has advanced and expanded since then. New versions of the programme have been released in both the U.S. and in Europe. Pharmaceutical companies licence the Happy Ending template and offer buyers of their smoking cessation products, programmes similar to Happy Ending as an adjunct. For more information in English please visit Pfizer's U.S. programme *GetQuit* at <http://www.chantix.com> or their UK programme *ActiveStop* at <http://www.nicorette.co.uk>. For more information in Norwegian, go to visit <http://www.happyending.no>.

**Self-help booklet.** The self-help booklet *Guide til Røykfrihet* [*Guide to Smokelessness*] is issued by the Norwegian Directorate for Health and Social Affairs (2005) and only available in Norwegian. It contains 44 pages with a mixture of coloured images and text. During the initial pages the smoker is provided with information about why quit, how to quit, what beneficial bodily reactions to expect, nicotine replacement therapy, withdrawal symptoms, and relapse. The booklet encourages setting a quit date 10 days ahead. During the 10-days the smoker is preparing by being given small assignments each day (e.g. writing down reasons for

quitting, start smoking outdoors, no smoking the first 15 minutes after waking and last 15 minutes before bedtime). The booklet contains a 10 days log-procedure to be used in this preparation phase. Here, smokers can fill out the number of cigarettes, the exact time of day for each cigarette, in what situations they were smoking, why they were smoking, and rate how well each cigarette tasted. There is also a 48 days quit calendar, a phone number to the Norwegian Directorate for Health and Social Affairs' quitline, and links to relevant websites.

***Use of nicotine replacement therapy.*** In both treatment conditions, participants received information and recommendations about nicotine replacement therapy (NRT). Due to technicalities it was neither possible nor desirable to modify this aspect of the programme or the booklet. However, this study intended to evaluate the clean effect of Happy Ending as is without the use of NRT. Participants who wished to quit smoking without using NRT were actively recruited. Everyone was informed about this and agreed to attempt quitting without NRT.

#### ***4.2 Sample Size and Recruitment***

The expected quit rate at 6 months was 30% in the intervention group and 15% in the control group. The alpha level was set to .05 (one-sided). With 150 participants in each condition there was a 92% chance of detecting a significant main effect between treatments.

Participants were recruited online using banners and advertisements in A-pressen (for more information, see; <http://www.apressen.no>) which is a group of media companies producing local and regional newspapers throughout Norway. The recruitment campaign lasted from the 6th to the 10th of February in 2006. According to statistics from A-pressen the banners were displayed 947,059 times and resulted in 2,595 hits, which gives a hit-rate of 0.27%.

The banners and advertisements redirected potential participants to a website containing study information, a scheme for informed consent, and a baseline questionnaire. Persons who (a) were willing to quit on the 6th of March 2006, (b) were aged  $\geq 18$  years, (c) were currently smoking five cigarettes or more on a daily basis, (d) were willing to quit without using any kind of medicines or tobacco products, (e) owned a mobile phone, (f) had Norwegian registered phone number and postal mail address, and (g) had daily access to Internet and email, were eligible candidates for inclusion in the study. The final pool of participants contained 427 unique registered entrants within the given period. Note that all participants were self-selected.

### 4.3 Randomization

Table 1 presents the restricted randomization procedure which was applied (for overview, see; Shadish, Cook & Campbell, 2002). In addition to the condition, the pool of participants was divided into two categories; men/women, to assure an equal number of males and females. This yielded  $N \approx 72$  participants in each cell distributed across four cells based on the two dichotomous variables condition and gender. All eligible participants were assigned random numbers by computer-based random number generation. Finally, every fourth participant was allocated to each category in a pre-decided order based on their random allotted number.

**Table 1**

*Allocation of Participants ( $N = 290$ )*

Treatment	Gender		Total
Condition	Men	Women	
Happy Ending			
Total	72	72	144
Self-Help Booklet	73	73	146
Total	145	145	290

One experimenter generated the allocation sequence and carried out the randomization procedure. A second experimenter registered and enrolled participants in the HE programme and sent the self-help booklets by postal mail service.

### 4.4 Blinding

Randomized control trials evaluating Internet-based interventions do not allow double-blind procedures to be carried out. Consequently, participants in the present study knew what treatment they received. However, they were not informed about their treatment assignment and what type of treatment other participants received. Neither was the experimenters blinded as e.g. registration and the nature of the surveys (i.e. exposure data) revealed which treatment condition the participants were assigned to. On the bright side, online-administered questionnaires with no face-to-face interactions between experimenters and participants help minimize biases introduced by humans (Eysenbach, 2002).

#### **4.5 Follow-Up Procedures**

Pre-cessation data were collected at baseline and 3-days prior to cessation. More specifically, baseline refers to the time of enrolment before randomization and study onset. In contrast, 3-days pre-cessation refers to after randomization and study onset. It corresponds to 11 days into the preparation phase in the programme, three days before the designated quit-date. Post-cessation data were collected at 1, 3, and 6 months.

An email containing a link to an online questionnaire was sent out to all participants at each measuring point. At 3-days pre-cessation, no further steps were employed to collect data. However, there was an extensive follow-up routine in the study to minimize attrition rates at 1, 3, and 6 months. Participants had 1 week to complete the questionnaire. During the second week two email reminders were sent out to non-responders and in the third week telephone interviews were conducted with participants who still had not responded. The telephone interviews were structured and standardized following the email questionnaire with the exception of exposure data and programme evaluation which naturally differed according to treatment. There were four attempts to contact participants in both conditions over telephone at every data collection.

Each data collection took three weeks to complete. The majority of responses (81%), however, were collected within the first week. There was no person-to-person counselling or face-to-face interaction between experimenters and participants at any point. However, participants were given the opportunity to pose questions regarding study accomplishments by email or telephone outside of the data collection.

#### **4.6 Measures**

Regarding all psychological measures, reliability scores were calculated to account for the psychometric properties and a two-way translation, i.e. translation – back translation procedure, was used to assess the translation work and semantically verify the contents. For more information on the scales and measures, see appendix E.

**Abstinence.** Abstinence data were based on self-reports. Primary outcome was abstinence at 6 months post cessation, defined as having been totally abstinent (*not even a puff*) for the last 7 days. Secondary outcomes were abstinence at 1 and 3 months post cessation. Participants with missing values on smoking status were coded as daily smokers.

**Demographics.** At baseline, participants reported postal address, mobile phone number, email address, gender, age, education, and whether they had daily access to the Internet. In addition, several smoking related questions were asked to assess smoking and quit history (e.g. ‘What was your age when you began smoking on a daily basis?’).

**Programme evaluation.** From the preparation phase and onwards, participants evaluated the programme (‘To what degree would you recommend Happy Ending/Guide til Røykfrihet to others that would like to quit smoking?’; ‘How useful do you think Happy Ending/Guide til Røykfrihet has been so far?’). Programme recommendation was rated on a 5-point scale from 1 (*not at all*) to 5 (*to a very high degree*) while programme usefulness was rated on a 5-point scale from 1 (*completely useless*) to 5 (*very useful*).

**Psychological measures.** Nicotine dependence was assessed by the use of the revised *Fagerström Test for Nicotine Dependence* (FTND; Heatherton, Kozlowski, Frecker & Fagerström, 1991). The FTND is a widely used six-item self-report measure (e.g. ‘How soon after you wake up do you smoke your first cigarette?’). According to Heatherton et al. (1991), the revised FTND has an internal consistency of .61. In the current study the Cronbach alpha coefficient was .68.

The *Self-Efficacy* scale (SE; Ajzen, 2002a; 2002b) is a two-item scale which corresponds to the perceived behavioural control dimension in the theory of planned behaviour (TpB). The items are constructed in line with the recommendations in the TpB (Ajzen, 2002a) and were measured both pre- and post-cessation. Both control belief strength (‘I will manage to quit smoking’) and control belief power (‘To quit smoking for good will be...’) was assessed. Statements were evaluated on a 7-point scale and the Cronbach alpha coefficient was .82 in the current study.

The *Coping Planning* scale (CP; Sniehotta et al. 2005) is a nine-item scale originally used in relation to physical exercise. Coping planning refers to behavioural and cognitive strategies used to link anticipated barriers and suitable responses. The scale in this study was adapted to smoking cessation and cut down to five items rated on a 4-point scale ranging from 1 (*completely disagree*) to 4 (*completely agree*). Respondents indicate to what degree a statement reflects how detailed plans they have made for suitable coping responses (e.g. ‘... when I have to pay extra attention to prevent lapses’). In the Sniehotta et al. study the CP scale had an internal consistency of .90. In the current study the scale had a Cronbach alpha coefficient of .86.

#### 4.7 Statistical Methods

An alpha level of .05 was chosen for all statistical tests and, unless otherwise specified, all tests were two-tailed. All continuous psychological scores were mean-centered ( $_{mc}$ ) with an exception for the baseline sample characteristics. To check for differences between experimental conditions at baseline,  $t$ -tests were employed for scales while  $\chi^2$  tests were performed for categorical data. Furthermore, all  $\chi^2$  tests that were based on 2 by 2 contingency tables applied the Yates' continuity correction. Outcomes were examined using the intent-to-treat (ITT) principle, i.e. abstinence rates were based on all participants who were included in the study after randomization. All participants who withdrew from the study or did not answer the abstinence questions were classified as smokers.

For each of the three post cessation abstinence measure points, the odds ratio (OR) with the 95% confidence interval (CI) and a  $\chi^2$  test for experimental condition was carried out to detect a main treatment effect. In order to examine the importance of background variables and experimental condition on abstinence, the block  $\chi^2$  in hierarchical logistic regression was compared to the overall -2 Log Likelihood (-2LL) to assess increases in explained variance.

A one-way between-groups analysis of variance was conducted to examine the impact of experimental condition on levels of self-efficacy and coping planning at 3-days pre-cessation separately. The eta squared for one-way between-groups analysis of variance was used to calculate the effect size.

In order to test mediation effects in logistic regression, two conditions must be met. The first condition is that the mediating variables should contribute to the equation. This entails a hierarchical logistic regression procedure to test if a subset variable makes a significant contribution to the model. Thus, experimental condition was entered in step one and 3-days pre-cessation self-efficacy $_{mc}$  and 3-days pre-cessation coping planning $_{mc}$  respectively in step two. Second, a reduction in the effects of the experimental condition should be evident after entering the subset variables. The experimental condition at step one should either become statistically non-significant or less significant in step two when the mediating variables are entered. If these two conditions are met, a mediating effect is established.

Finally,  $t$ -tests were employed to evaluate differences in overall perceived program usefulness and program recommendation at 3 months. The eta squared for independent-samples  $t$ -tests was carried out to calculate effect sizes while descriptives were applied to explore component ratings and the use of components at 1 month.

## 5 Results

The flow chart of participants (from; Altman et al., 2001) is depicted in figure A1, appendix A. A total of 427 participants were eligible of which 131 participants were excluded. Twenty-three did not meet the inclusion criteria, 6 had an invalid email address, 1 reported being signed up for the study by a person other than himself, and 19 were suspected to know each other. The latter were excluded to reduce the risk of communication across experimental conditions. This was done based on sharing or having the same family name, postal address, email address, mobile phone number, IP-address, and worksite. Furthermore, participants ( $N = 82$ ) with missing values on important variables (e.g. gender) or missing values on several items were also excluded from the pool. None of the 296 eligible entrants had missing values on more than one item which was imputed by the item sample means. Six participants out of 296 were excluded after study onset because they did not fulfil the inclusion criteria. Four participants had quit smoking two weeks prior to the intervention, one participant had been signed up by another person without consent, and one participant gave away his or her position without giving notice. Consequently, the final number submitted for analysis was 290, i.e. 144 in the HE group and 146 in the control group.

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Insert Figure A1 about here,  
see Appendix A

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### 5.1 *Baseline Data and Response Rates*

Baseline sample characteristics are represented in table 2. Independent-samples  $t$ -tests and  $\chi^2$  tests were conducted to evaluate the baseline characteristics between conditions. There were no variables on which treatment and control participants differed significantly which supports the validity of follow-up outcomes.



**Table 2***Baseline Sample Characteristics by Condition (N = 290)*

	Treatment n = 144	Control n = 146
Gender		
Male	72 (50.0)	73 (50.0)
Female	72 (50.0)	73 (50.0)
Education		
0-9 years	9 (6.3)	13 (8.9)
10-12 years	65 (45.1)	57 (39.0)
13-15 years	43 (29.9)	50 (34.2)
16 + years	27 (18.8)	26 (17.8)
Age	39.5 ± 11.0	39.7 ± 10.8
Age at smoking onset	16.2 ± 2.8	15.9 ± 2.8
FTND	4.5 ± 2.3	4.6 ± 2.2
Pre-cessation self-efficacy	5.1 ± 1.4	5.1 ± 1.3
Coping Planning	2.3 ± 0.6	2.4 ± 0.7

*Note.* Numbers represent mean ± standard deviation for continuous variables and number of observations with percentage of observations in parenthesis, respectively.

The proportion of participants responding to the online questionnaires were 91%, 85%, 79%, and 68% for 3-days pre-cessation, 1, 3, and 6 months post-cessation respectively. A pattern of descending response rates over time was evident. Furthermore, total response rates after the complete follow-up procedure were 91%, 92%, 92%, and 84% for 3-days pre-cessation, 1, 3, and 6 months post-cessation respectively. The average response rate (after email reminders and telephone interviews) was 92% in the experimental group and 87% in the control group. While a larger proportion of participants in the experimental group ( $N = 124$ ; 86%) responded than control participants ( $N = 120$ ; 82%) at 6 months follow-up, the difference in attrition rates [ $\chi^2(1) = 0.57, p = .45$ ] did not reach statistical significance. Between-groups differences in attrition rates were statistically non-significant at 3-days pre-cessation [ $\chi^2(1) = 0.13, p = .71$ ] and 3 months post-cessation [ $\chi^2(1) = 1.06, p = .30$ ]. 12 (4%) and 15 (5%) were missing at 3-days pre-cessation and 9 (3%) and 15 (5%) were missing at 3 months in the HE and SHB group respectively. However, the between-groups difference in

attrition rates at 1 month was statistically significant [ $\chi^2(1) = 7.48, p = .006$ ]. 19 (13%) respondents were missing in the control group while 5 (3.5%) were missing in the experimental group. Hence, selective attrition may have compromised the results at 1 month.

## 5.2 Abstinence

Table 3 presents 1, 3, and 6 months cessation outcomes by treatment condition. The primary 6 months ITT analysis found a statistically significant 7-days abstinence rate among participants assigned to HE [ $\chi^2(1) = 9.42, p = .002$ ; OR = 2.59, 95% CI: 1.43 - 4.69] compared to the SHB. Statistically significant differences between HE and SHB were also present at 1 [ $\chi^2(1) = 19.91, p < .001$ ; OR = 3.46, 95% CI: 2.01 - 5.95] and 3 months [ $\chi^2(1) = 13.73, p < .001$ ; OR = 2.93, 95% CI: 1.67 - 5.14]. The results demonstrate that the treatment effect was consistent over time. The odds ratios decreased from 1 month to 6 months, but the confidence intervals were predominantly overlapping.

**Table 3**

*Comparison of Abstinence Rates Between HE and the SHB (N = 290)*

Abstinence rates	HE		SHB		OR	95% CI	P-value
	N	%	N	%			
7-days abstinence at 1 month	60	41.7	25	17.1	3.46	2.01-5.95	.000*
7 days abstinence at 3 months	51	36.8	23	15.8	2.93	1.67-5.14	.000*
7 days abstinence at 6 months	42	29.2	20	13.7	2.59	1.43-4.69	.002

Note. \* $p < .0005$ .

As previously mentioned, this study was set to assess the clean effect of the HE programme without the use of NRT. In spite of this, many participants chose to use NRT which is most likely a consequence of the recommendations about NRT in both HE and the SHB. At 6 months 17 (8%) participants in the HE group and 9 (4%) participants in the SHB group reported having used NRT during the last 7 days. The difference in NRT usage [ $\chi^2(1) = 1.60, p = .21$ ] was statistically non-significant suggesting that differences in NRT usage did not compromise the results at 6 months. An additional analysis was carried out excluding those who reported using NRT during the last 7 days and those who had a missing value on the item at 6 months. The total number of participants submitted for analysis was 198. Overall, a statistically significant difference of HE compared to the SHB prevailed [ $\chi^2(1) =$

4.78,  $p = .03$ ; OR = 2.26, 95% CI: 1.14 - 4.48], indicating that HE was effective without the adjunct of NRT.

### **5.3 Interaction Effects**

Hierarchical logistic regression was used to test for interaction effects between HE and several background variables. The number of participants included in each analysis was 290. No interaction effects appeared for age, education or nicotine dependence. However, there was a significant increase in explained variance for gender [block  $\chi^2(1) = 4.00$ ,  $p = .05$ ; OR = 3.47, 95% CI: 1.00 - 12.09]. More specifically, males in HE had statistically significant higher abstinence rates as compared to the SHB group at 6 months ( $B = 1.66$ ,  $p = .001$ ; OR = 5.24, 95% CI: 1.99 - 13.84). There was no such effect among females in HE as compared to the SHB group upon abstinence ( $B = 0.41$ ,  $p = .30$ ; OR = 1.51, 95% CI: 0.70 - 3.31).

### **5.4 Between-Groups Differences in Self-Efficacy and Coping Planning**

A one-way between-groups analysis of variance was conducted to explore the impact of experimental condition on levels of self-efficacy at 3-days pre-cessation. There was a statistically significant difference in self-efficacy scores between HE ( $M = 5.48$ ,  $SD = 1.23$ ) and the control condition [ $M = 5.08$ ,  $SD = 1.26$ ;  $F(1, 261) = 6.94$ ,  $p = .009$ ]. Despite reaching statistical significance, the actual difference in mean scores between groups was small. The effect size, calculated using eta squared, was 0.03 which means only 3% of the explained variance in 3-days pre-cessation self-efficacy could be accounted for by the experimental condition.

Similarly, a one-way between-groups analysis of variance was conducted to explore the impact of experimental condition on levels of coping planning at 3-days pre-cessation. There was a statistically significant difference in coping planning between HE ( $M = 3.00$ ,  $SD = 0.53$ ) and the control condition [ $M = 2.80$ ,  $SD = 0.52$ ;  $F(1, 261) = 9.4$ ,  $p = .002$ ]. The estimated effect size, using eta squared, was 0.03 which means only 3% of the explained variance in 3-days pre-cessation coping planning could be accounted for by the experimental condition. Overall, HE enhances self-efficacy and coping planning levels, but to a small magnitude.

## 5.5 Mediation

In order to test for mediation, experimental condition was entered in step one and 3-days pre-cessation self-efficacy<sub>mc</sub> was entered into a hierarchical logistic regression in step two. Table B4.1, in appendix B.01, presents the results from the mediation analysis. There was a statistically significant improvement in block  $\chi^2(1) = 18.45, p < .000$ , between step one and step two, supporting the first condition for mediation. Also, an increase in the measures of the predictive efficacy of the logistic regression was achieved when self-efficacy<sub>mc</sub> was included in the model. The increase was evident in  $R_N^2$  and in the percentage of cases correctly predicted (68.4% vs. 71.5%). The second condition for mediation is a reduction in the explanatory power of the experimental condition after the inclusion of self-efficacy<sub>mc</sub>. The result did show that the experimental condition had a lower coefficient in step two, but it was still statistically significant at the same  $p$ -value ( $B = 1.08, p < .000$ ). The finding meets the first condition for mediation in logistic regression, but not the second condition as is required. Hence, 3-days pre-cessation self-efficacy<sub>mc</sub> did not mediate the effect of the experimental condition on abstinence at 1 month.

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Insert Table B5.1 about here,  
see Appendix B.01

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Table C5.1 in appendix C.01 presents the results of the test for mediation between experimental condition, 3-days pre-cessation coping planning<sub>mc</sub>, and abstinence at 1 month. A statistically significant improvement in block  $\chi^2(1) = 5.25, p = .02$ , between step one and step two was achieved, supporting the first condition for mediation. There was an increase in  $R_N^2$ , but a slight decrease in the predictive efficacy from 68.4% to 68.1% when coping planning<sub>mc</sub> was entered into the model. The result also shows that the experimental condition has a lower coefficient in step two, but the experimental condition is still statistically significant at the same  $p$ -value ( $B = 1.10, p < .000$ ) as in model 1. Thus, the finding does not support the second condition for mediation in logistic regression.

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Insert Table C5.1 about here,  
see Appendix C.01

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## **5.6 Programme Evaluation**

There was a statistically significant difference in perceived usefulness of HE ( $M = 3.37$ ,  $SD = 1.45$ ) as compared to the SHB [ $M = 2.59$ ,  $SD = 1.22$ ;  $t(245) = (-4.57)$ ,  $p < .000$ ] at 3 months. However, the effect size of the differences in the means was very small (eta squared = 0.08). Expressed as percentages, 8.0% of the variance in perceived usefulness of the programme was explained by the experimental condition. Even though there was a difference in the perceived usefulness of the treatments, the degree to which participants would recommend HE ( $M = 3.00$ ,  $SD = 1.47$ ) to others as compared to the SHB [ $M = 2.85$ ,  $SD = 1.30$ ;  $t(248) = (-0.85)$ ,  $p = .40$ ] was statistically non-significant at 3 months.

In addition, participants rated the perceived usefulness of the different programme components in HE at 1 month. Presented in descending order, the components are ranked from the most useful to the least useful; the log-off procedure ( $M = 3.40$ ,  $SD = 1.51$ ), text messages ( $M = 3.27$ ,  $SD = 1.44$ ), log-on procedure ( $M = 3.26$ ,  $SD = 1.53$ ), interactive diary ( $M = 2.95$ ,  $SD = 1.37$ ), relapse prevention system ( $M = 2.84$ ,  $SD = 1.48$ ), and the Helpline ( $M = 2.39$ ,  $SD = 1.25$ ). Less than 5% of the participants in HE reported they had never used the log-off procedure, text messages, log-on procedure, and interactive diary suggesting a high utility rate. However, approximately one fourth reported they had never used the Helpline or the relapse prevention system suggesting less than optimal compliance.

## **5.7 Adverse Effects**

About 10 participants reported in open-ended questions that HE was too intensive, in the sense that it interfered with work and personal life. They used descriptions like “annoying”, “bothersome”, and “stressful”. These remarks might suggest that HE can potentially be inappropriate for a smaller group of certain smokers which for example have night- and shift work. Other than that, no remarks were made about any negative experiences or consequences of HE.

## 6 Discussion

### 6.1 *Synopsis*

This trial demonstrated the efficacy of the Internet-, mobile phone-, and IVR-based smoking cessation programme HE over the SHB. The efficacy persisted when removing the effect of NRT. The treatment effect was consistent across sample subgroups defined by age, education, and nicotine dependence. However, males benefited more from HE when compared to the SHB group. No such effect was observed for females. In addition, HE managed to increase levels of self-efficacy and coping planning, but neither mediated the relationship between the experimental condition and abstinence. Overall, HE was perceived somewhat more useful than the SHB, although participants would not recommend HE to others more than participants would recommend the booklet. Most participants utilized the programme components in HE, but approximately one fourth did not use the Helpline or relapse prevention system.

### 6.2 *Interpretation of the Results*

**Abstinence.** Most ICT-based smoking cessation interventions are randomized trials, apply the ITT analysis, use similar statistical methods, and online recruitment procedures (Cobb, Graham, Bock, Papandonatos & Abrams, 2005; Etter, 2005; Feil, Noell, Lichtenstein, Boles & McKay, 2003; Lenert et al. 2003; Munoz et al., 2006; Rodgers et al., 2005; Stoddard et al., 2005; Strecher et al., 2005; Swartz et al., 2006). However, few assess long-term outcomes, many apply different recruitment strategies (e.g. stage-based vs. treatment seeking smokers), different operationalizations for measures of abstinence (e.g. point-prevalence vs. continuous abstinence) and many have unequal lengths and procedures for follow-up which all cause problems of interpretation (for a discussion, see; West, Hajek, Stead & Stapleton, 2005). Evidently, even different recruitment strategies will result in widely different samples which make no sense to compare abstinence rates. Similar problems apply when extending and comparing the findings with other types of smoking cessation interventions. Thus, it becomes necessary to compare effect sizes, i.e. the odds ratios and their corresponding confidence intervals.

Figure D2 in appendix D depicts the odds ratios with 95% confidence intervals for the different studies and types of interventions compared next. The comparison of ICT-based

interventions is restricted to digitally-delivered and fully automated interventions which are the most similar to HE. There are three previous trials (Rodgers et al., 2005; Strecher et al., 2005; Swartz et al., 2006) which have demonstrated an effect for up to 3 months post-cessation. The study by Rodgers et al. used relative risk, as opposed to odds ratio, which complicates direct comparison. Nevertheless, it is emphasized that they did not find a long-term effect, but merely a 6 weeks effect. The long-term effect (6 months) of the present study as compared to the 3 months effect in the Strecher et al. study is higher with a barely overlapping lower limit of the CI. The only study with a comparable effect was carried out by Swartz et al. They attained a slightly higher OR at 3 months, but the CI is even wider than in the present study.

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Insert Figure D2 about here,  
see Appendix D

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In terms of the OR, the long-term effect of HE outperforms the long-term effects of a variety of self-help interventions including social support (May, West, Hajek, McEwen & McRobbie, 2006; see also; May & West, 2000), telephone counselling (Stead, Perera & Lancaster, 2006), and different forms of tailored self-help materials, i.e. written materials, audio-, and videotapes (Lancaster & Stead, 2005a). The lower limit CI in the current trial is only slightly overlapping with the upper limits for telephone counselling and tailored self-help materials. When compared to the pooled effects of individual behavioural counselling (Lancaster & Stead, 2005b) and group behavioural therapy (Stead & Lancaster, 2005), HE has a higher long-term OR. However, the lower limit of the CI does overlap with both individual behavioural counselling and group behavioural therapy although the upper limit is considerably higher in HE. Finally, compared to the pooled effect of different forms of NRT, i.e. gum, patch, nasal spray, inhaler, and sublingual tablet, the long-term OR in HE is higher (Silagy et al., 2004). The CI for HE even consumes the entire treatment effect of NRT.

Clearly, the comparisons favour the HE programme as an efficacious ICT-based smoking cessation treatment although the CI is considered to be wide. Information and communication technology provides a new channel for delivering smoking cessation interventions inexpensively, conveniently and irrespective of location without requiring human labour – an argument often advocated in research on Internet interventions (Strecher, 2007; Swartz et al.,

2006). This trial makes a significant contribution to the promise of digitally delivered and fully automated interventions. It is, to the best of our knowledge, the first trial to document a long-term effect and to provide a thorough description of the theoretical foundation.

***The gender effect.*** HE had a greater effect on males than on females which reflects the traceable effect of gender in smoking cessation outcome (Wetter et al., 1999; for examples, see; Carlson, Goodey, Bennett, Taenzer & Koopmans, 2002; Perkins, Donny & Caggiula, 1999). Gender by itself is not a meaningful theoretical or clinical explanatory factor, but requires examining the association of gender and abstinence in conjunction with other variables (Wetter et al., 1999). Collins et al. (2004) has argued that women are more likely than men to manage negative affect by smoking. Indeed, bupropion which is an antidepressant with demonstrated effectiveness in smoking cessation (Hughes, Stead & Lancaster, 2007; Jorenby et al., 1999) has evidenced to erase the effect of gender on relapse (Gonzalez et al., 2002). HE addresses negative affect, but this study was not set to empirically examine this relationship. However, negative affect may theoretically help explain the observed effect of gender on cessation outcome.

***Between-groups differences.*** The results showed that HE increases levels of both self-efficacy and coping planning although only to a small extent. A plausible reason for the small effect could be that only 11 days had passed since programme initiation. More importantly, this study managed to document changes in psychological constructs related to an ICT-based intervention. Most ICT-based smoking cessation research focus on investigating smoking cessation outcome, use of incentives on attrition rates, testing online questionnaires vs. paper-and-pencil methods, etc. (for examples, see; Feil et al., 2003; Lenert et al., 2003; Stoddard et al., 2005). None of these studies explicitly trace and document any psychological constructs. In order to improve ICT-based interventions, it becomes necessary to find exactly what constructs (e.g. self-efficacy) are associated with positive outcomes. It cannot be taken for granted that the active ingredients are the same online as off-line.

***Mediation.*** The effect of the between-groups analyses of self-efficacy and coping planning suggested a mediation effect would be small. And as the first condition for mediation was confirmed while the second condition failed to support mediation, the occurrence of a type II error cannot be ruled out. The sample size required to detect medium effect sizes with linear mediational models is relatively large (> 500; MacKinnon, Lockwood, Hoffman, West and



Sheets, 2002) and similar sample sizes for adequate estimations in logistic mediational models has been suggested (Huang, Sivaganesan, Succop & Goodman, 2004). Another explanation can be that selective attrition at 1 month may have compromised the detection of mediation. However, as both self-efficacy and coping planning are immanent in all participants, as opposed to abstinence, mediation should be less affected by attrition rates. One last explanation may actually assume a theoretical basis. Sayette (2004) has suggested that many quitters manage to perform appropriate and learned coping responses when temptations are low to moderate. However, when temptations become strong, a loss of cognitive control makes quitters unable to apply specified coping responses which results in self-regulatory failure. Several studies support the reasoning provided by Sayette (2004) which seems to apply to self-efficacy as well (for examples, see; Bliss, Garvey & Ward, 1999; Gwaltney, Shiffman & Sayette, 2005; Sayette & Hufford, 1994; Tiffany, 1990; Gwaltney, Shiffman, Balabanis et al., 2005; Shiffman, Paty et al., 1996). Consequently, *in vivo* skills training is suggested, before making the actual quit attempt, to improve implementation of appropriate coping responses during strong temptations (Sayette, 2004). In short, *in vivo* skills training entails e.g. performing coping planning during longer periods of deprivation since last cigarette.

***Programme utility.*** Although the perceived usefulness of HE was assessed, the fact that as much as one fourth reported they had never used two of the components highlights an issue which needs to be discussed. It may be tempting to interpret non-utility as an indication of low compliance, but several other explanations might account for the lack of use (e.g. technological barriers or difficulties understanding instructions). ICT-based interventions find themselves at the intercept between human-computer interactions, and should seriously take into consideration the psychological aspects of human use of computing (for overview, see; Olson & Olson, 2003). For example, most smoking cessation websites are not available in alternative formats which decreases accessibility (e.g. for people with reduced sight; Bock et al. 2004). According to the Norwegian Association of the Blind and Partially Sighted (2007), Norway has 130,000 persons with reduced sight to such a degree that they are considered visually impaired. Obviously, this excludes not just participants from participating in research, but perhaps more seriously it excludes research and smoking cessation interventions to aid the visually impaired.

### 6.3 Limitations

**Self-reported data.** Abstinence was measured solely by self-reporting due to the geographical spread of the sample. However, self-reported data are generally accurate and does not require biochemical verification when samples are (a) population-based, (b) includes data collection by telephone or Internet, and (c) when there is low intensity, low frequency, and no face-to-face contact between researcher and participant (Velicer, Prochaska, Rossi & Snow, 1992; Benowitz et al., 2002; Glasgow et al., 1993; Patrick et al., 1994). Neither did the sample consist of particular subgroups which warrant caution (e.g. adolescents; see; Attebring, Herlitz, Berndt, Karlsson & Hjalmarson, 2001; Caraballo, Giovino & Pechacek, 2004; Parna et al., 2005).

**Accessibility.** There is a concern regarding the demographic disparity in access to the Internet for the age group 60 years and above. These potential participants belong to the group with the least access to the Internet (Tjøstheim, 1999; TNS Gallup, 2001) which might preclude sample representativeness and generalizability of findings. Otherwise, statistics for Norway indicate high accessibility to the Internet and mobile phones in the general population (Statistics Norway, 2006; TNS Gallup, 2001). Given a broad national ICT covering like in Norway, ICT-based interventions allow a wide geographical spread of the sample which is actually a great strength as participants can be recruited literally from all over the world and further enhance generalizability.

**Contamination.** The relatively unaltered abstinence rate in the SHB group suggests contamination. The suspicion was substantiated when inspecting the outliers in the data material, but which were included because of the ITT analyses. A vast majority of the outliers were found belonging to the SHB group. Considering that treatment seeking smokers are most likely to seek alternative treatment when a one approach fails, contamination becomes a fair concern. Especially when remembering that the booklet provides several useful tips on resources like the national quitline and a variety of websites. Also, remember that participants not interested in using NRT were actively recruited which adds truth towards the suspicion of contamination by other treatments than NRT.

## 6.4 Generalizability

**Self-selection.** The recruitment procedure in this trial was based on self-selection. Consequently, generalizations must be done with caution. There are two subgroups of smokers which might preclude representativeness. One is research volunteers and the other is treatment seeking smokers. Both have been found to differ from self-quitters in the general population on several characteristics (Hughes, Giovino, Klevens & Fiore, 1997) and they may be susceptible towards participation to receive free treatments (McClure et al., 2006). Furthermore, Cobb and Graham (2006) specifically attempted to characterize Internet users searching for smoking cessation information and found that more than half of the participants were motivated treatment seeking smokers planning to quit the next 30 days. This indicates that treatment seekers actively use the Internet to stop smoking and are likely to be research volunteers as well. Together, research volunteers and treatment seekers are most likely considerably more motivated to change the habit. Evidence of clearer benefits in subgroups of smokers motivated to quit has also been found previously (Stead et al., 2006). On the other hand, comparing participants in HE to other treatment seeking smokers, e.g. smokers that buy HE outside of the research context, is likely to provide a conservative treatment effect as it takes place in a natural setting. Thus, the natural setting imposes realism which enhances generalizability.

**Intent-to-treat.** Data were analysed as if participants had received the full experimental treatment or only the control treatment. It is very strict to assume that every participant has adhered to the prescribed protocol (Gross & Fogg, 2004). Thus, the inclusion of participants with varying degrees of adherence mirrors real-world behaviour which enhances generalizability. It is also unreasonable to treat every non-responder as a smoker. There may be many trivial reasons why participants do not respond (e.g. blockage of emails due to spam filters, tight work schedules, changed phone number without giving notice). As such the intent-to-treat principle is likely to have provided a conservative estimate. In addition to the low attrition rates and significant treatment effect, there is every reason to be confident about the findings.

## **6.5 Conclusion**

The study found the digitally delivered and fully automated smoking cessation programme Happy Ending to be an effective smoking cessation treatment. The randomized control trial and ITT analyses lend confidence to the findings as it reduces the plausibility of alternative explanations and provides conservative estimates. Additionally, the programme was in particular effective for males and documented increases in self-efficacy and coping planning although no mediation was found. Happy Ending was perceived somewhat more useful than the self-help booklet while the Helpline and the relapse prevention system were not utilized to its full potential. The findings extend to online treatment seeking smokers with some uncertainty regarding elderly aged 60 years and above.

Considering that modest increases in smoking cessation are likely to have practical and clinical significance, smoking cessation is likely to have substantial effects on mortality and morbidity. It has been estimated that an effect of as little as 1% on 6 months continuous abstinence would result in at least 3 years of additional years of life for every 100 40-year-old smoker treated (West, 2007). Imagining that HE produced a 6 months continuous abstinence rate, given the current results, a 29% continuous abstinence rate would save 87 years of life per 100 smokers treated. Even though treating a smoker with Happy Ending costs 1500,- NOK and many smokers will need more than one treatment, the price required for successful cessation quickly fades. Over and above personal health, the implications of smoking cessation are among other things associated with lower health care expenses, increased work productivity, and decreased absenteeism (Fiore, Hatsukami & Baker, 2002). Thus, Happy Ending and other ICT-based smoking cessation programmes which offer relatively high-reach, high-efficacy, and low-cost population-based treatments can effectively help people and society to suppress the epidemic of our modern times.

## 7 Reference List

- Ajzen, I. (2002a). Constructing a TpB questionnaire: Conceptual and methodological considerations. Retrieved February 15, 2007, from <http://www-unix.oit.umass.edu/~aizen/index.html>
- Ajzen, I. (2002b). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behaviour [Electronic version]. *Journal of Applied Social Psychology*, 32, 1 - 20.
- Altman, D. G., Schulz, K. F., Moher, D., Egger, M., Davidoff, F., Elbourne, D., et al. (2001). The revised CONSORT Statement for reporting randomized trials: Explanation and elaboration [Electronic version]. *Annals of Internal Medicine*, 134, 663 - 694.
- Attebring, M. F., Herlitz, J., Berndt, A.-K., Karlsson, T. & Hjalmarson, A. (2001). Are patients truthful about their smoking habits? A validation of self-report about smoking cessation with biochemical markers of smoking activity amongst patients with ischaemic heart disease [Electronic version]. *Journal of Internal Medicine*, 249, 145 - 151.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change [Electronic version]. *Psychological Review*, 84, 191 - 215.
- Bandura, A. (1982). Self-efficacy mechanism in human agency [Electronic version]. *American Psychologist*, 37, 122 - 147.
- Bandura, A. (1989). Human agency in social cognitive theory [Electronic version]. *American Psychologist*, 44, 1175 - 1184.
- Baumeister, R. F. & Heatherton, T. F. (1996). Self-regulation failure: An overview [Electronic version]. *Psychological Inquiry*, 7(1), 1 - 15.
- Baumeister, R. F., Heatherton, T. F. & Tice, D. M (1994). *Losing control. How and why people fail at self-regulation*. San Diego: Academic Press.
- Benowitz, N. L., Jacob III, P., Ahijevych, K., Jarvis, M. J., Hall, S., LeHouezec, J., et al. (2002). Biochemical verification of tobacco use and cessation. SRNT subcommittee on biochemical verification [Electronic version]. *Nicotine & Tobacco Research*, 4, 149 - 159.
- Berge, T. & Repål, A. (2005). *Den indre samtalen: Kognitiv terapi i praksis [The inner conversation: Cognitive therapy in practice]* (2nd ed.). Oslo: Gyldendal Akademisk.
- Bliss, R. E., Garvey, A. J. & Ward, K. D. (1999). Resisting temptations to smoke: Results from within-subjects analyses [Electronic version]. *Psychology of Addictive Behaviors*, 13, 143 - 151.

- Bock, B. C., Graham, A. L., Sciamanna, C. N., Krishnamoorthy, J., Whiteley, J., Carmona-Barros, R., et al. (2004). Smoking cessation treatment on the Internet: Content, quality, and usability [Electronic version]. *Nicotine and Tobacco Research*, 6, 207 - 219.
- Brandon, T. H., Tiffany, S. T., Obremski, K. M. & Baker, T. B. (1990). Postcessation cigarette use: The process of relapse [Electronic version]. *Addictive Behaviors*, 15, 105 - 114.
- Caraballo, R. S., Giovino, G. A. & Pechacek, T. F. (2004). Self-reported cigarette smoking vs. serum cotinine among U.S. adolescents [Electronic version]. *Nicotine & Tobacco Research*, 6, 19 - 25.
- Carlson, L. E., Goodey, E., Bennett, M. H. Taenzer, P. & Koopmans, J. (2002). The addition of social support to a community-based large-group behavioral smoking cessation intervention: Improved cessation rates and gender differences [Electronic version]. *Addictive Behaviors*, 27, 547 - 559.
- Cassell, M. M., Jackson, J. & Cheuvront, B. (1998). Health communication on the Internet: An effective channel for health behaviour change? [Electronic version]. *Journal of Health Communication*, 3, 71 - 79.
- Centers for Disease Control and Prevention. (2002). Annual smoking-attributable mortality, years of potential life lost, and economic costs – United States, 1995-1999 [Electronic version]. *Morbidity and Mortality Weekly Report*, 51, 300 - 303.
- Centers for Disease Control and Prevention. (2005). Annual smoking-attributable mortality, years of potential life lost, and productivity losses – United States, 1997-2001 [Electronic version]. *Morbidity and Mortality Weekly Report*, 54, 625 - 628.
- Cobb, N. K. & Graham, A. L. (2006). Characterizing the Internet searchers of smoking cessation information. *Journal of Medical Internet Research*, 8, Article no.: e17. Retrieved April 15, 2007, from <http://www.jmir.org/2006/3/e17>
- Cobb, N. K., Graham, A. L., Bock, B. C., Papandonatos, G. & Abrams, D. G. (2005). Initial evaluation of a real-world Internet smoking cessation system [Electronic version]. *Nicotine & Tobacco Research*, 7, 207 - 216.
- Cokkinides, V. E., Ward, E., Jemal, A. & Thun, M. J. (2005). Under-use of smoking-cessation treatments. Results from the national Health Interview Survey, 2000 [Electronic version]. *American Journal of Preventive Medicine*, 28, 119 - 122.

- Collins, B. N., Wileyto, E. P., Patterson, F., Rukstalis, M., Audrain-McGovern, J., Kaufmann, V., et al. (2004). Gender differences in smoking cessation in a placebo-controlled trial with bupropion with behavioral counselling [Electronic version]. *Nicotine & Tobacco Research*, 6, 27 - 37.
- Condiotte, M. M. & Lichtenstein, E. (1981). Self-efficacy and relapse in smoking cessation programs [Electronic version]. *Journal of Consulting and Clinical Psychology*, 49, 648 - 658.
- Cunningham, J. A., Ferrence, R., Cohen, J. & Adlaf, E. M. (2003). Interest in self-help materials among a general population sample of smokers [Electronic version]. *Addictive Behaviors*, 28, 811 - 816.
- Danaei, G., Hoorn, S. V., Lopez, A. D., Murray, C. J. L., Ezzati, M. & the Comparative Risk Assessment Collaborating Group. (2005). Causes of cancer in the world: Comparative risk assessment of nine behavioural and environmental risk factors [Electronic version]. *The Lancet*, 366, 1784 - 1793.
- Dijkstra, A. & Brosschot, J. (2003). Worry about health in smoking behaviour change [Electronic version]. *Behaviour Research and Therapy*, 41, 1081 - 1092.
- Dijkstra, A. & Wolde, G. T. (2005). Ongoing interpretations of accomplishments in smoking cessation: Positive and negative self-efficacy interpretations [Electronic version]. *Addictive Behaviors*, 30, 219 - 234.
- Doll, R., Peto, R., Boreham, J. & Sutherland, I. (2004). Mortality in relation to smoking: 50 years' observations on male British doctors [Electronic version]. *British Medical Journal*, 328, 1519 - 1528.
- Dybing, E. & Sanner, T. (1995). Passiv røyking og risiko for hjerteinfarkt [Passive smoking and risk of heart disease. (Electronic version)]. *Norsk Epidemiologi [Norwegian Journal of Epidemiology]*, 5, 135 - 140.
- Dybing, E. & Sanner, T. (1999). Passive smoking, sudden infant death syndrome (SIDS), and childhood infections [Electronic version]. *Human & Experimental Toxicology*, 18, 202 - 205.
- Etter, J.-F. (2005). Comparing the efficacy of two Internet-based, computer-tailored smoking cessation programs: A randomized trial. *Journal of Medical Internet Research*, 7, Article no.: e2. Retrieved February 15, 2007, from <http://www.jmir.org/2005/1/e2>
- Etter, J.-F. (2006). Internet-based smoking cessation programs [Electronic version]. *International Journal of Medical Informatics*, 75, 110 - 116.

- Eysenbach, G. (2002). Issues in evaluating health websites in an Internet-based randomized controlled trial. *Journal of Medical Internet Research*, 4, Article no.: e17. Retrieved February 15, 2007, from <http://www.jmir.org/2002/3/e17>
- Ezzati, M. & Lopez, A. D. (2003). Estimates of global mortality attributable to smoking in 2000 [Electronic version]. *The Lancet*, 362, 847 - 852.
- Fagerström, K. (2002). The epidemiology of smoking: Health consequences and benefits of cessation [Electronic version]. *Drugs*, 62 (Suppl. 2), 1 - 9.
- Feil, E. G., Noell, J., Lichtenstein, E., Boles, S. M. & McKay, H. G. (2003). Evaluation of an Internet-based smoking cessation program: Lessons learned from a pilot study [Electronic version]. *Nicotine & Tobacco Research*, 5, 189 - 194.
- Fiore, M. C., Bailey, W. C., Cohen, S. J., Dorfman, S. F., Goldstein, M. G., Gritz, E. R., et al. (2000). *Clinical practice guide: Treating tobacco use and dependence* [Electronic version]. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service.
- Fiore, M. C., Hatsukami, D. K. & Baker, T. B. (2002). Effective tobacco dependence treatment [Electronic version]. *Journal of American Medical Association*, 288, 1768 - 1771.
- Gilbert, H. M. & Warburton, D. M. (2003). Attribution and the effects of expectancy: How beliefs can influence the experiences of smoking cessation [Electronic version]. *Addictive Behaviors*, 28, 1359 - 1369.
- Glasgow, R. E., Mullooly, J. P., Vogt, T. M., Stevens, V. J., Lichtenstein, E., Hollis, J. F., et al. (1993). Biochemical validation of smoking status: Pros, cons, and data from four low-intensity intervention trials [Electronic version]. *Addictive Behaviors*, 18, 511 - 527.
- Gollwitzer, P. M. (1999). Implementation Intentions. Strong Effects of Simple Plans [Electronic version]. *American Psychologist*, 54, 493 - 503.
- Gollwitzer, P. M., Fujita, K. & Oettingen, G. (2004). Planning and implementation of goals. In Baumeister, R. F. & Vohs, K. D. (Eds.): *Handbook of self-regulation. Research, theory, and applications*. New York: Guilford Press.
- Gonzalez, D., Bjornson, W., Durcan, M. J., White, J. D., Johnston, J. A., Buist, S., et al. (2002). Effects of gender on relapse prevention in smokers treated with bupropion SR [Electronic version]. *American Journal of Preventive Medicine*, 22, 234 - 239.
- Gross, D. & Fogg, L. (2004). A critical analysis of the intent-to-treat principle in prevention research [Electronic version]. *The Journal of Primary Prevention*, 25, 475 - 488.



- Gulliver, S. B., Hughes, J. R., Solomon, L. J. & Dey, A. N. (1995). An investigation of self-efficacy, partner support and daily stresses as predictors of relapse to smoking in self-quitters. *Addiction*, 90, 767 - 772.
- Gwaltney, C. J., Shiffman, S., Balabanis, M. & Paty, J. A. (2005). Dynamic self-efficacy and outcome expectancies: Prediction of smoking lapse and relapse [Electronic version]. *Journal of Abnormal Psychology*, 114, 661 - 675.
- Gwaltney, C. J., Shiffman, S. & Sayette, M. A. (2005). Situational correlates of abstinence self-efficacy [Electronic version]. *Journal of Abnormal Psychology*, 114, 649 - 660.
- Haustein, K.-O. (2003). *Tobacco or health? Physiological and social damages caused by tobacco smoking*. Berlin: Springer.
- Heatherton, T. F., Kozlowski, L. T., Frecker, R. C. & Fagerström, K.-O. (1991). The Fagerström Test for Nicotine Dependence: A revision of the Fagerström Tolerance Questionnaire. *British Journal of Addiction*, 86, 1119 - 1127.
- Huang, B., Sivaganesan, S., Succop, P. & Goodman, E. (2004). Statistical assessment of mediational effects for logistic mediational models [Electronic version]. *Statistics in Medicine*, 23, 2713 - 2728.
- Hughes, J. R., Giovino, G. A., Klevens, R. M. & Fiore, M. C. (1997). Assessing the Generalizability of Smoking Studies [Electronic version]. *Addiction*, Vol. 92, No. 4, p. 469-472.
- Hughes, J. R., Keely, J. & Naud, S. (2004). Shape of the Relapse Curve and Long-Term Abstinence Among Untreated Smokers [Electronic version]. *Addiction*, 99, 29 - 38.
- Hughes, J. R., Stead, L. F. & Lancaster, T. (2007). Antidepressants for Smoking Cessation. *Cochrane Database of Systematic Reviews*, 1, Article no.: CD000031. Retrieved April 15, 2007, from <http://www.cochrane.org>
- Humerfelt, S. & Gulsvik, A. (1995). Røyking og kronisk obstruktiv lungesykdom hos menn bosatt i Bergen [Smoking and chronic obstructive lung disease among men in Bergen. (Electronic version)]. *Norsk Epidemiologi [Norwegian Journal of Epidemiologi]*, 5, 129 - 134.
- Jacobs, D. R., Adachi, H., Mulder, I., Kromhout, D., Menotti, A., Nissinen, A. et al. (1999). Cigarette smoking and mortality risk. *Archives of Internal Medicine*, 159, 733 - 740.
- Jorenby, D. E., Leischow, S. J., Nides, M. A., Rennard, S. I., Johnston, J. A., Hughes, A. R., et al. (1999). A controlled trial of sustained-release bupropion, a nicotine patch, or both for smoking cessation [Electronic version]. *The New England Journal of Medicine*, 340, 685 - 693.

- Kenford, S. L., Smith, S. S., Wetter, D. W., Jorenby, D. E., Fiore, M. C. & Baker, T. B. (2002). Predicting relapse back to smoking: Contrasting affective and physical models of dependence [Electronic version]. *Journal of Consulting and Clinical Psychology*, 70, 216 - 227.
- Kraft, P., Svendsen, T. & Hauknes, A. (1998). Intention to stop smoking among Norwegian smokers: The role of nicotine dependence, type of cigarettes, and age at onset of daily smoking. *Addictive Behaviors*, 23, 133 - 137.
- Lancaster, T. & Stead, L. F. (2004). Physician advice for smoking cessation. *Cochrane Database of Systematic Reviews*, 4, Article no.: CD000165. Retrieved April 27, 2007, from <http://www.cochrane.org>
- Lancaster, T. & Stead, L. F. (2005a). Self-help interventions for smoking cessation. *Cochrane Database of Systematic Reviews*, 3, Article no.: CD001118. Retrieved January 20, 2007, from <http://www.cochrane.org>
- Lancaster, T. & Stead, L. F. (2005b). Individual behavioural counselling for smoking cessation. *Cochrane Database of Systematic Reviews*, 2, Article no.: CD001292. Retrieved January 20, 2007, from <http://www.cochrane.org>
- Larimer, M. E., Palmer, R. S. & Marlatt, G. A. (1999). Relapse prevention: An overview of Marlatt's cognitive-behavioral model [Electronic version]. *Alcohol Research and Health*, 23, 151 - 160.
- Lenert, L., Munoz, R. F., Stoddard, J., Delucchi, K., Bansod, A., Skoczen, S. et al. (2003). Design and pilot evaluation of an Internet smoking cessation program [Electronic version]. *Journal of the American Informatics Association*, 10, 16 - 20.
- Lichtenstein, E. & Glasgow, R. E. (1992). Smoking cessation: What have we learned over the past decade? [Electronic version]. *Journal of Consulting and Clinical Psychology*, 60, 518 - 527.
- Lund, K. E. & Lund, M. (2005). Røyking og sosial ulikhet i Norge [Smoking and social inequalities in Norway. (Electronic version)]. *Tidsskrift for Den Norske Lægeforening*, 125, 560 - 563.
- Lund, M., Lund, K. E. & Rise, J. (2005). Sosiale ulikheter og røykeslutt blant voksne [Social inequalities and smoking cessation among adults; Electronic version]. *Tidsskrift for Den Norske Lægeforening*, 125, 564 - 568.
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G. & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects [Electronic version]. *Psychological Methods*, 7, 83 - 104.

- Marlatt, G. A. & Gordon, J. R. (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press.
- May, S. & West, R. (2000). Do social support interventions (“buddy systems”) aid smoking cessation? A review [Electronic version]. *Tobacco Control*, 9, 415 - 422.
- May, S., West, R., Hajek, P., McEwen, A. & McRobbie, H. (2006). Randomized controlled trial of a social support (‘buddy’) intervention for smoking cessation [Electronic version]. *Patient Education and Counselling*, 64, 235 - 241.
- McClure, J. B., Greene, S. M., Wiese, C., Johnson, K. E., Alexander, G. & Strecher, V. (2006). Interest in an online smoking cessation program and effective recruitment strategies: Results from Project Quit. *Journal of Medical Internet Research*, 8, Article no.: e14. Retrieved April 28, 2007, from <http://www.jmir.org/2006/3/e14>
- Moan, I. S. & Rise, J. (2005). Quitting smoking: Applying an extended version of the theory of planned behavior to predict intention and behaviour [Electronic version]. *Journal of Applied Biobehavioral Research*, 10, 39 - 68.
- Munoz, R. F., Lenert, L. L., Delucchi, K., Stoddard, J., Perez, J. E., Penilla, C. et al. (2006). Toward evidence-based Internet interventions: A Spanish/English web site for international smoking cessation trials [Electronic version]. *Nicotine and Tobacco Research*, 8, 77 - 87.
- Muraven, M. & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? [Electronic version]. *Psychological Bulletin*, 126, 247 - 259.
- Niaura, R. S., Rohsenow, D. J., Binkoff, J. A., Monti, P. M., Pedraza, M. & Abrams, D. B. (1988). Relevance of cue reactivity to understanding alcohol and smoking relapse [Electronic version]. *Journal of Abnormal Psychology*, 97, 133 - 152.
- Norman, P., Conner, M. & Bell, R. (1999). The theory of planned behavior and smoking cessation. *Health Psychology*, 18, 89 - 94.
- Norwegian Association of the Blind and Partially Sighted. (2007). Retrieved April 23, 2007, from <http://www.blindeforbundet.no>
- Norwegian Directorate for Health and Social Affairs. (2003). *Røykfrihet og helse – informasjon om helserisiko ved aktiv og passiv røyking* [Smokelessness and health – information about the health risk by active and passive smoking]. Oslo: Norwegian Directorate for Health and Social Affairs.
- Norwegian Directorate for Health and Social Affairs. (2004). *Tall om tobakk 1973-2003* [Tobacco figures 1973-2003]. Oslo: Norwegian Directorate for Health and Social Affairs.

- Norwegian Directorate of Health and Social Affairs. (2005). *Guide til røykfrihet* [Guide to smokelessness (Booklet)]. Oslo: Norwegian Directorate for Health and Social Affairs.
- Ockene, J. K., Emmons, K. M., Mermelstein, R. J., Perkins, K. A., Bonollo, D. S., Voorhees, C. C. et al. (2000). Relapse and maintenance issues for smoking cessation [Electronic version]. *Health Psychology, 19*(Suppl.), 17 - 31.
- Ockene, J. K., Kristeller, J., Pbert, L., Hebert, J. R., Luippold, R., Goldberg, R. J., Landon, J. et al. (1994). The physician-delivered smoking intervention project: Can short-term interventions produce long-term effects for a general outpatient population? [Electronic version]. *Health Psychology, 13*, 278 - 281.
- Olson, G. M. & Olson, J. S. (2003). Human-computer interaction: Psychological aspects of the human use of computing [Electronic version]. *Annual Review of Psychology, 54*, 491 - 516.
- Parna, K., Rahu, M., Youngman, L. D., Rahu, K., Nygård-Kibur, M. & Koupil, I. (2005). Self-reported and serum-cotinine validated smoking in pregnant women in Estonia [Electronic version]. *Maternal and Child Health Journal, 9*, 385 - 392.
- Patrick, D. L., Cheadle, A., Thompson, D. C., Diehr, P., Koepsell, T. & Kinne, S. (1994). The validity of self-reported smoking: A review and meta-analysis [Electronic version]. *American Journal of Public Health, 84*, 1086 - 1093.
- Perkins, K. A., Donny, E. & Caggiula, A. R. (1999). Sex differences in nicotine effects and self-administration: Review of human and animal evidence [Electronic version]. *Nicotine and Tobacco Research, 1*, 301 - 315.
- Peto, R., Lopez, A. D., Boreham, J., Thun, M. & Heath, C., Jr. (1992). Mortality from tobacco in developed countries: Indirect estimation from national vital statistics [Electronic version]. *The Lancet, 339*, 1268 - 1278.
- Piasecki, T. M. (2006). Relapse to Smoking [Electronic version]. *Clinical Psychology Review, 26*, 196 - 215.
- Piasecki, T. M., Fiore, M. C. & Baker, T. B. (1998). Profiles in discouragement: Two studies of variability in the time course of smoking withdrawal symptoms [Electronic version]. *Journal of Abnormal Psychology, 107*, 238 - 251.
- Piasecki, T. M., Fiore, M. C., McCarthy, D. E. & Baker, T. B. (2002). Have we lost our way? The need for dynamic formulations of smoking relapse proneness [Electronic version]. *Addiction, 97*, 1093 - 1108.

- Piasecki, T. M., Jorenby, D. E., Smith, S. S., Fiore, M. C. & Baker, T. B. (2003a). Smoking withdrawal dynamics: I. Abstinence distress in lapsers and abstainers [Electronic version]. *Journal of Abnormal Psychology*, 112, 3 - 13.
- Piasecki, T. M., Jorenby, D. E., Smith, S. S., Fiore, M. C. & Baker, T. B. (2003b). Smoking withdrawal dynamics: II. Improved tests of withdrawal-relapse relations [Electronic version]. *Journal of Abnormal Psychology*, 112, 14 - 27.
- Piasecki, T. M., Jorenby, D. E., Smith, S. S., Fiore, M. C. & Baker, T. B. (2003c). Smoking withdrawal dynamics: III. Correlates of withdrawal heterogeneity [Electronic version]. *Experimental and Clinical Psychopharmacology*, 11, 276 - 285.
- Piasecki, T. M., Kenford, S. L., Smith, S. S., Fiore, M. C. & Baker, T. B. (1997). Listening to nicotine: Negative affect and the smoking withdrawal conundrum [Electronic version]. *Psychological Science*, 8, 184 - 189.
- Piasecki, T. M., Niaura, R., Shadel, W. G., Abrams, D., Goldstein, M., Fiore, M. C. et al. (2000). Smoking withdrawal dynamics in unaided quitters [Electronic version]. *Journal of Abnormal Psychology*, 109, 74 - 86.
- Rodgers, A., Corbett, T., Bramley, D., Riddell, T., Wills, M., Lin, R-B. et al. (2005). Do U Smoke After Txt? Results of a Randomised Trial of Smoking Cessation Using Mobile Phone Text Messaging [Electronic version]. *Tobacco Control*, 14, 255 - 261.
- Rothman, A. J. (2000). Toward a theory-based analysis of behavioral maintenance [Electronic version]. *Health Psychology*, 19(Suppl.), 64 - 69.
- Rothman, A. J., Baldwin, A. S. & Hertel, A. W. (2004). Self-regulation and behaviour change: Disentangling behavioral initiation and behavioral maintenance. In Baumeister, R. F. & Vohs, K. D. (Eds.): *Handbook of Self-Regulation. Research, theory and applications*. New York: Guilford Press.
- Sanner, T. & Dybing, E. (1996). Helseskader ved passiv røyking [Health consequences by passiv smoking. (Abstract)]. *Tidsskrift for Den Norske Lægeforening*, 116, 617 - 620. Retrieved March 6, 2007, from <http://www.tidsskriftet.no/tsweb/199605/art7.html>
- Sanner, T. (2005). Antall dødsfall som skyldes røyking går ned [The proportion of deaths caused by smoking is decreasing. (Electronic version)]. *Tidsskrift for Den Norske Lægeforening*, 23, 125.
- Sayette, M. A. (2004). Self-regulatory failure and addiction. In Baumeister, R. F. & Vohs, K. D. (Eds.): *Handbook of self-regulation. Research, theory, and applications*. New York: Guilford.

- Sayette, M. A. & Hufford, M. R. (1994). Effects of cue exposure and deprivation on cognitive resources in smokers [Electronic version]. *Journal of Abnormal Psychology*, 103, 812 - 818.
- Schwarzer, R. & Fuchs, R. (1995). Self-efficacy and health behaviours. In Conner, M. & Norman, P. (Eds.): *Predicting health behaviour: Research and practice with social cognition models*. Buckingham, UK: Open University Press.
- Shadish, W. R., Cook, T. D. & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin Company.
- Sheeran, P., Webb, T. L. & Gollwitzer, P. M. (2005). The interplay between goal intentions and implementation intentions [Electronic version]. *Personality and Social Psychology Bulletin*, 31, 87 - 98.
- Shiffman, S. (2005). Dynamic influences on smoking relapse process [Electronic version]. *Journal of Personality*, 73, 1715 - 1748.
- Shiffman, S., Balabanis, M. H., Paty, J. A., Engberg, J., Gwaltney, C. J., Liu, K. S., et al. (2000). Dynamic effects of self-efficacy on smoking lapse and relapse [Electronic version]. *Health Psychology*, 19, 315 - 323.
- Shiffman, S., Hickcox, M., Paty, J. A., Gnys, M., Kassel, J. D. & Richards, T. J. (1996). Progression from a smoking lapse to relapse: Prediction from abstinence violation effects, nicotine dependence, and lapse characteristics [Electronic version]. *Journal of Consulting and Clinical Psychology*, 64, 993 - 1002.
- Shiffman, S., Hickcox, M., Paty, J. A., Gnys, M., Kassel, J. D. & Richards, T. J. (1997). The abstinence violation effect following smoking lapses and temptations [Electronic version]. *Cognitive Therapy and Research*, 21, 497 - 523.
- Shiffman, S., Paty, J. A., Gnys, M., Kassel, J. A. & Hickcox, M. (1996). First lapses to smoking: Within-subjects analysis of real-time reports [Electronic version]. *Journal of Consulting and Clinical Psychology*, 64, 366 - 379.
- Shiffman, S. & Waters, A. J. (2004). Negative affect and smoking lapses: A prospective analysis [Electronic version]. *Journal of Consulting and Clinical Psychology*, 72, 192 - 201.
- Silagy, C., Lancaster, T. Stead, L. F., Mant, D. & Fowler, G. (2004). Nicotine replacement therapy for smoking cessation. *Cochrane Database of Systematic Reviews*, 3, Article no.: CD000146. Retrieved April 15, 2007, from <http://www.cochrane.org>

- Sniehotta, F. F., Scholz, U. & Schwarzer, R. (2006). Bridging the intention-behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance physical exercise [Electronic version]. *Psychology and Health*, 20, 143 - 160.
- Sniehotta, F. F., Schwarzer, R., Scholz, U. & Schuz, B. (2005). Action planning and coping planning for long-term lifestyle change: Theory and assessment [Electronic version]. *European Journal of Social Psychology*, 35, 565 - 576.
- Spoth, R. (1991). Smoking cessation program preferences associated with stage of quitting [Electronic version]. *Addictive Behaviors*, 16, 427 - 440.
- Statistics Norway. (2006). *ICT in the households, 2006. 6 out of 10 households have broadband*. Retrieved February 15, 2007, from <http://www.ssb.no/english>.
- Statistics Norway. (2007). *Smoking in Norway, 2006. The share of daily smokers is still decreasing*. Retrieved March 15, 2007, from <http://www.ssb.no/english>
- Stead, L. F. & Lancaster, T. (2005). Group behaviour therapy programmes for smoking cessation. *Cochrane Database of Systematic Reviews*, 2, Article no.: CD001007. Retrieved January 20, 2007, from <http://www.cochrane.org>
- Stead, L. F., Perera, R. & Lancaster, T. (2006). Telephone counselling for smoking cessation. *Cochrane Database of Systematic Review*, 3, Article no.: CD002850. Retrieved January 20, 2007, from <http://www.cochrane.org>
- Stoddard, J. L., Delucchi, K. L., Munoz, R., F., Collins, N. M. Perez Stable, E. J. Augustson, E. et al. (2005). Smoking cessation research via the Internet: A feasibility study [Electronic version]. *Journal of Health Communication*, 10, 27 - 41.
- Strecher, V. (1999). Computer-tailored smoking cessation materials: A review and discussion [Electronic version]. *Patient Education and Counseling*, 36, 107 - 117.
- Strecher, V. (2007). Internet methods for delivering behavioural and health-related interventions (eHealth) [Electronic version]. *Annual Review of Clinical Psychology*, 3, 53 - 76.
- Strecher, V. J., Shiffman, S. & West, R. (2005). Randomized controlled trial of a web-based computer-tailored smoking cessation program as a supplement to nicotine patch therapy [Electronic version]. *Addiction*, 100, 682 - 688.
- Stuart, K., Borland, R. & McMurray, N. (1994). Self-efficacy, health locus of control, and smoking cessation [Electronic version]. *Addictive Behaviors*, 19, 1 - 12.
- Swartz, L. H. G., Noell, J. W., Schroeder, S. W. & Ary, D. V. (2006). A randomised control study of a fully automated Internet-based smoking cessation programme [Electronic version]. *Tobacco Control*, 15, 7 - 12.

- Tiffany, S. T. (1990). A cognitive model of drug urges and drug-use behavior: Role of automatic and nonautomatic processes [Electronic version]. *Psychological Review*, 97, 147 - 168.
- Tjøstheim, I. (1999). *Informasjonssamfunnet i Norge nå. Status og ferske fakta om e-handel og IKT bruk* [The information society in Norway now. Status and new facts about e-commerce and ICT use]. Retrieved February 17, 2007, from <http://www.nr.no/~ingvar/>.
- TNS Gallup (2001). *Norge på verdenstoppen* [Norway at the world top]. Retrieved February 17, 2007, from <http://www.tns-gallup.no>
- Tverdal, A. (1995). Røyking og hjerte-kardødelighet [Smoking and cardiovascular mortality. (Electronic version)]. *Norsk Epidemiologi* [Norwegian Journal of Epidemiologi], 5, 115 - 120.
- U.S. Department of Health and Human Services. *The health consequences of smoking: A report of the Surgeon General*. (2004). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.
- U.S. Department of Health and Human Services. *The health consequences of involuntary exposure to tobacco smoke: A report of the Surgeon General*. (2006). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.
- Ussher, M., West, R. & Hibbs, N. (2004). A survey of pregnant smokers' interest in different types of smoking cessation support [Electronic version]. *Patient Education and Counseling*, 54, 67 - 72.
- Velicer, W. F., Prochaska, J. O., Rossi, J. S. & Snow, M. G. (1992). Assessing outcome in smoking cessation studies [Electronic version]. *Psychological Bulletin*, 111, 23 - 41.
- Vohs, K. D. & Schmeichel, B. J. (2003). Self-regulation and the extended now: Controlling the self alters the subjective experience of time [Electronic version]. *Journal of Personality and Social Psychology*, 82, 217 - 230.
- Vollset, S. E., Selmer, R., Tverdal, A. & Gjessing, H. K. (2006). *Hvor dødelig er røyking? Rapport om dødsfall og tapte leveår som skyldes røyking* [How lethal is smoking? Report about deaths and lost years caused by smoking]. Oslo: Folkehelseinstituttet.
- Vollset, S. E., Tverdal, A. & Gjessing, H. K. (2006). Smoking and deaths between 40 and 70 years of age in women and men [Electronic version]. *Annals of Internal Medicine*, 144, 381 - 389.

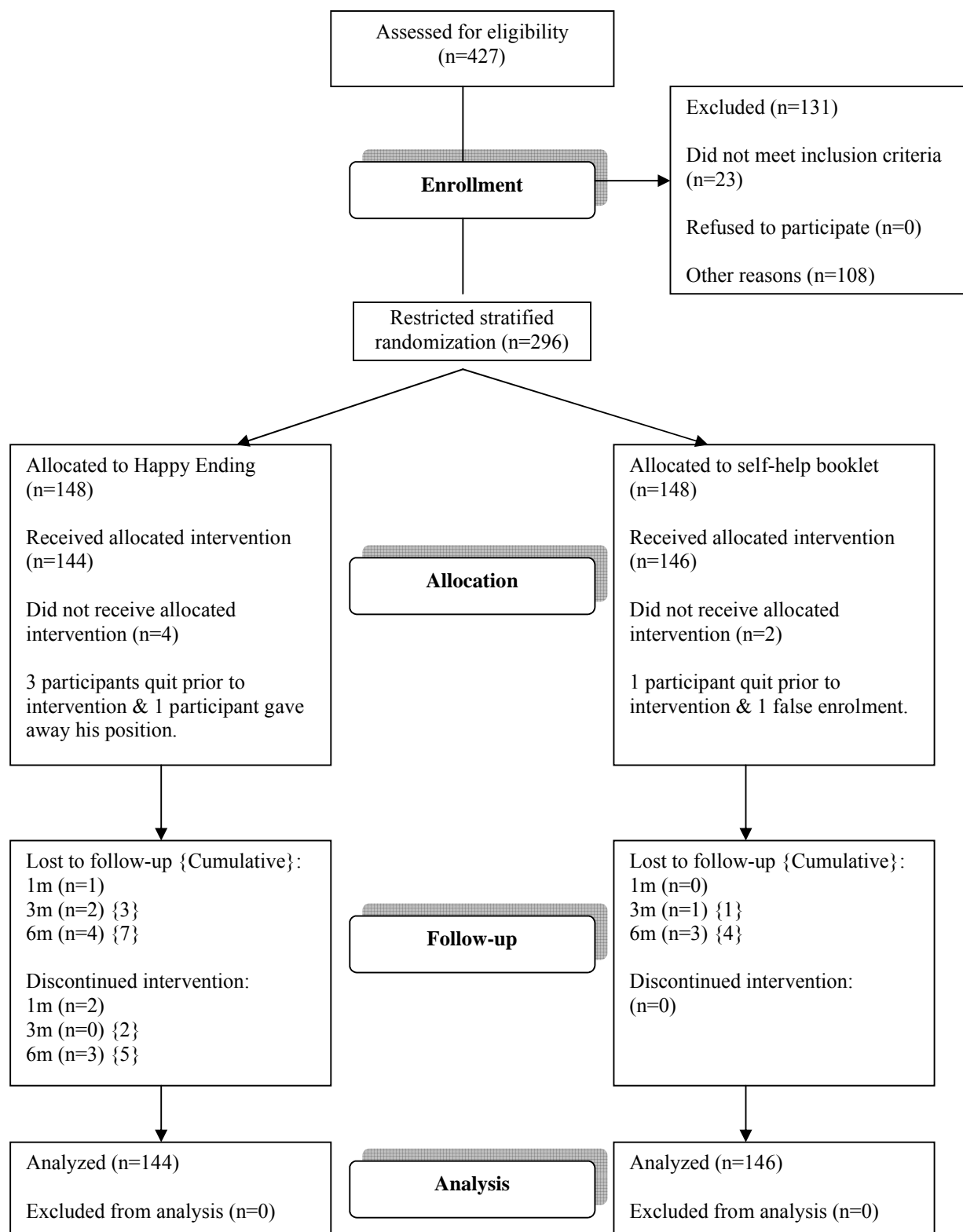


- Walters, S. T., Wright, J. A. & Shegog, R. (2006). A review of computer and Internet-based interventions for smoking behavior [Electronic version]. *Addictive Behaviors*, 31, 264 - 277.
- Ward, K. D., Klesges, R. C., Zbikowski, S. M., Bliss, R. E. & Garvey, A. J. (1997). Gender differences in the outcome of an unaided smoking cessation attempt [Electronic version]. *Addictive Behaviors*, 22, 521 - 533.
- West, R. (2007). The clinical significance of “small” effects of smoking cessation treatments [Editorial; Electronic version]. *Addiction*, 102, 506 - 509.
- West, R., Hajek, P., Stead, L. & Stapleton, J. (2005). Outcome criteria in smoking cessation trials: Proposal for a common standard [Electronic version]. *Addiction*, 100, 299 - 303.
- West, R., McNeill, A. & Raw, M. (2000). Smoking cessation guidelines for health professionals: An update [Electronic version]. *Thorax*, 55, 987 - 999.
- Wetter, D. W., Kenford, S. L., Smith, S. S., Fiore, M. C., Jorenby, D. E. & Baker, T. B. (1999). Gender differences in smoking cessation [Electronic version]. *Journal of Consulting and Clinical Psychology*, 67, 555 - 562.
- World Health Organization. (2002). *The World Health Report: Reducing Risks, Promoting Healthy Life*. Geneva: World Health Organization.
- World Health Organization. (2007). *The European Tobacco Control Report*. Copenhagen: World Health Organization Regional Office for Europe.
- Zhu, S.-H., Melcer, T., Sun, J., Rosbrook, B. & Pierce, J. P. (2000). Smoking cessation with and without assistance. A population-based study [Electronic version]. *American Journal of Preventive Medicine*, 18, 305 - 311.

## APPENDIX A

**Figure A1**

*The Flow Chart of Participants (from Altman et al., 2001)*



*Note.* Post cessation data were collected for participants that discontinued the intervention.

## APPENDIX B

### B.01 Table B4.1

*The Relationship between Experimental Condition, 3-Days Pre-Cessation Self-Efficacy, and Abstinence at 1 Month (N = 263)*

Predictor	Model 1	Model 2
Constant	-1.45**	-1.47**
Experimental condition	1.20**	1.08**
Self-efficacy <sub>mc</sub>		0.53**
Model $\chi^2$	19.21**	37.65**
Degrees of freedom	1	2
Block $\chi^2$		18.45**
Degrees of freedom		1
Percent correctly predicted	68.4	71.5
Cox & Snell $R^2$	0.07	0.13
Nagelkerke $R^2$	0.10	0.19

*Note.* B-values are given for predictors. Experimental condition coded as 0 = self-help booklet, 1 = Happy Ending.  $\chi^2(8) = 3.95$ ,  $p = .86$  (Hosmer & Lemeshow). -2LL = 290.31. \*\*  $p < .001$ .

**B.02 Table B4.2**

*Intercorrelations for the Relationship between Experimental Condition, 3-Days Pre-Cessation Self-Efficacy, and Abstinence at 1 month (N = 263)*

Measure	1	2	3
1. Abstinence	--		
2. Experimental condition	.270**	--	
3. Self-efficacy <sub>mc</sub>	.304*	.268	--

*Note.* Abstinence coded as 0 = smoker, 1 = abstinent. Experimental condition coded as 0 = self-help booklet, 1 = Happy Ending.  $\Phi$  correlation coefficient calculated between nominal variables.  $\eta$  correlation coefficient calculated between nominal and interval variables. \* $p < .05$ . \*\* $p < .001$ .

**B.03 Table B4.3**

*Mean Values and Frequencies for Measures as a Function of Abstinence at 1 Month (N = 263)*

Measure	Smoker (N = 205)	Abstinent (N = 85)	$\chi^2(1)$ or $t(213)$
Experimental condition (%)	41	71	19.90*
Pre-cessation self-efficacy <sub>mc</sub>	-0.24	0.53	-5.36*

*Note.* Experimental condition coded as 0 = self-help booklet, 1 = Happy Ending.  $\chi^2$  test used between categorical measures;  $t$ -test used for other measures. \* $p < .001$ .

## APPENDIX C

### C.01 Table C5.1

*The Relationship between Experimental Condition, 3-Days Pre-Cessation Coping Planning, and Abstinence at 1 Month (N = 263)*

Predictor	Model 1	Model 2
Constant	-1.45**	-1.41**
Experimental condition	1.20**	1.10**
Coping planning <sub>mc</sub>		0.62*
Model $\chi^2$	19.21**	24.46**
Degrees of freedom	1	2
Block $\chi^2$		5.25*
Degrees of freedom		1
Percent correctly predicted	68.4	68.1
Cox & Snell $R^2$	0.07	0.08
Nagelkerke $R^2$	0.10	0.13

*Note.* B-values are given for predictors. Experimental condition coded as 0 = self-help booklet, 1 = Happy Ending.  $\chi^2(8) = 13.80$ ,  $p = .09$  (Hosmer & Lemeshow). -2LL = 303.51. \* $p < .05$ . \*\* $p < .001$ .

**C.02 Table C5.2**

*Intercorrelations for the Relationship between Experimental Condition, 3-Days Pre-Cessation Coping Planning, and Abstinence at 1 Month (N = 263)*

Measure	1	2	3
1. Abstinence	--		
2. Experimental condition	.270**	--	
3. Coping planning <sub>mc</sub>	.330	.374*	--

*Note.* Abstinence coded as 0 = smoker, 1 = abstinent. Experimental condition coded as 0 = self-help booklet, 1 = Happy Ending.  $\Phi$  correlation coefficient calculated between nominal variables.  $\eta$  correlation coefficient calculated between nominal and interval variables. \*p .05. \*\*p < .001.

**C.03 Table C5.3**

*Mean Values and Frequencies for Measures as a Function of Abstinence at 1 Month (N = 263)*

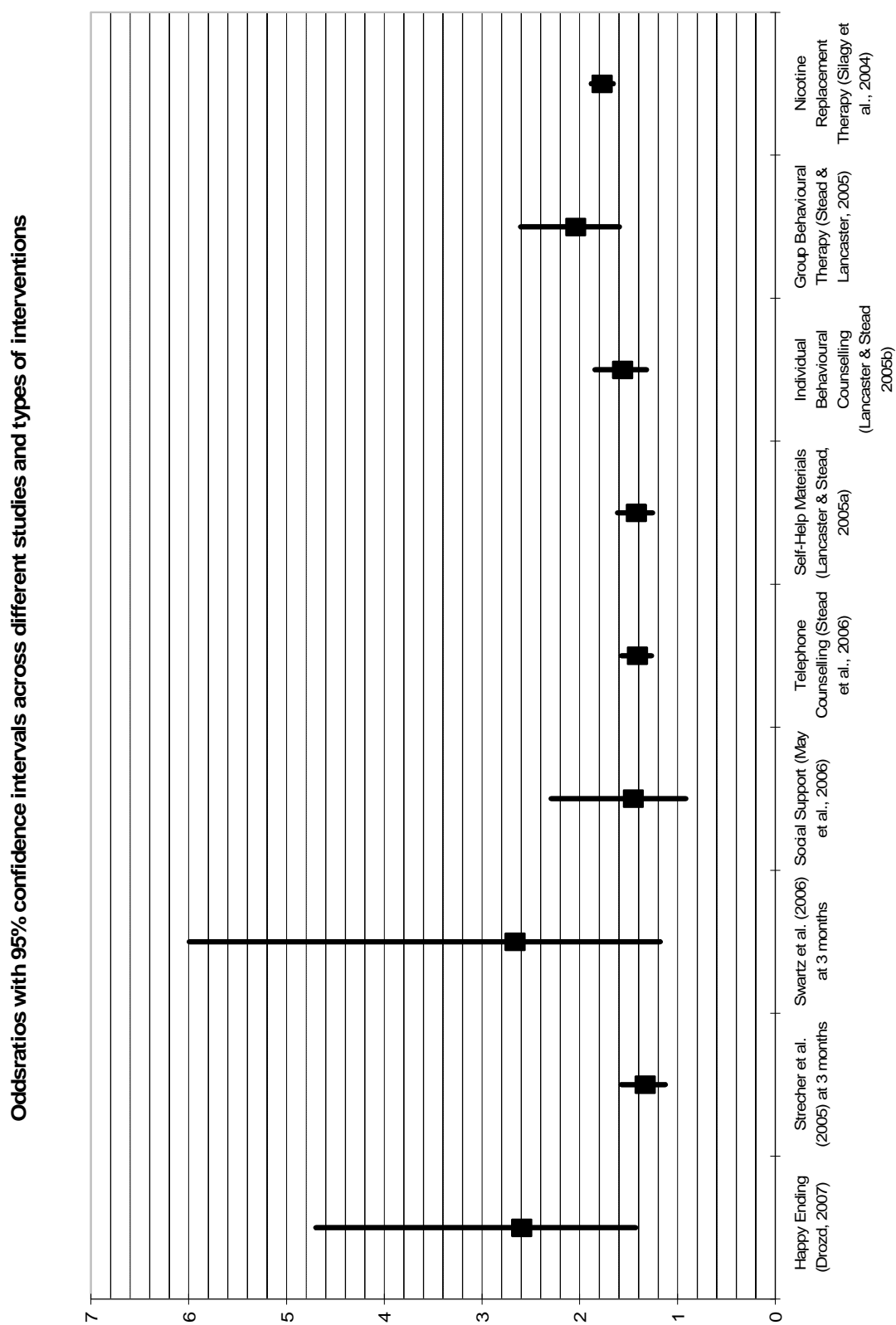
Measure	Smoker (N = 205)	Abstinent (N = 85)	$\chi^2(1)$ or $t(261)$
Experimental condition (%)	41	71	19.90*
Pre-cessation coping planning <sub>mc</sub>	-0.07	0.14	-3.00*

*Note.* Experimental condition coded as 0 = self-help booklet, 1 = Happy Ending.  $\chi^2$  test used between categorical measures;  $t$ -test used for other measures. \*p < .01.

## APPENDIX D

**Figure D2**

*Comparison of Treatment Effects across Different Studies and Types of Interventions*



## APPENDIX E

### Scales and Measures

#### *Abstinence og bruk av nikotinerstatningsprodukter:*

1. Tenk på de siste 7 dagene. Hvor mange sigaretter har du røykt i løpet av disse dagene?  
Velg det svaralternativet som passer best for deg.

- a) Jeg har ikke en gang tatt ett trekk av en sigarett
- b) Jeg har røykt av og til
- c) Jeg har røykt daglig

2. Har du brukt nikotinerstatningsprodukter i løpet av de siste sju dagene?

Ja \_\_\_\_\_ Nei \_\_\_\_\_

#### *Programevaluering:*

3. Hvor nyttig synes du disse elementene i Happy Ending har vært for deg i sluttetesten?

- |                          |                         |
|--------------------------|-------------------------|
| a) Sluttetdagboka        | b) Røykesugtelefonen    |
| c) Pålogging om morgenen | d) Avlogging om kvelden |
| e) Terapi ved glipp      | f) SMS meldinger        |

Svar kategorier: 1 = *helt unyttig* - 5 = *svært nyttig* – 6 = *har ikke brukt denne*



***The Revised Fagerström Test for Nicotine Dependence (FTND):***

**4.** Hvor lang tid etter at du våkner om morgenen tenner du din første sigarett?

- a) Over en time etter \_\_\_\_\_      b) 31-60 minutter \_\_\_\_\_  
c) 6-30 minutter \_\_\_\_\_      d) Mindre enn 5 minutter etter \_\_\_\_\_

**5.** Hvilken sigarett er vanskeligst å unnvære; er det den første om morgenen eller er det en senere på dagen?

- a) En senere på dagen \_\_\_\_\_      b) Morgens første \_\_\_\_\_

**6.** Har du problemer med å la være å røyke på steder der røyking er forbudt?

Ja \_\_\_\_\_      Nei \_\_\_\_\_

**7.** Hvor mange sigaretter røyker du gjennomsnittlig per dag? Oppgi kun ett antall (dvs. ikke oppgi et intervall). \_\_\_\_\_

**8.** Røyker du dersom du er så syk at du er sengeliggende mesteparten av dagen?

Ja \_\_\_\_\_      Nei \_\_\_\_\_

**9.** Røyker du mer om morgenen enn senere på dagen?

Ja \_\_\_\_\_      Nei \_\_\_\_\_

***Self-efficacy (SE):***

**10.** Vurder følgende påstander:

- a) Jeg kommer til å klare å slutte å røyke
- b) For meg vil det å slutte å røyke være

Svar kategorier: 1 = *svært usannsynlig* – 7 = *svært sannsynlig*

***Coping planning:***

**11.** Vurder hvor godt disse fem påstandene passer for deg.

Jeg har lagt konkrete planer for ...

- a) ... hvilke situasjoner jeg bør unngå for ikke å bli fristet til å røyke
- b) ... hva jeg skal gjøre i vanskelige situasjoner slik at jeg ikke ”glipper”
- c) ... når jeg må være ekstra påpasselig for ikke å få en ”glipp”
- d) ... hvordan jeg skal mestre røykesuget hvis det kommer
- e) ... hva jeg skal gjøre hvis jeg får en ”glipp”

Svar kategorier: 1 = *helt uenig* - 4 = *helt enig*